

**UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY**

In re Schering-Plough
Corporation/ENHANCE Securities
Litigation

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) Case No.2:08-cv-00397 (DMC) (JAD)
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DECLARATION OF CHAD COFFMAN, CFA

I. INTRODUCTION

1. My name is Chad Coffman. I am the President of Winnemac Consulting, a Chicago-based firm that specializes in the application of economics, finance, statistics, and valuation principles to questions that arise in a variety of contexts, including, as here, in the context of litigation.

2. I have been asked by counsel for the Lead Plaintiffs in this matter to examine and opine on:

- i. Whether the market for Schering-Plough Corporation common stock (“Schering Common Stock” or “Common Stock”) was efficient during the Class Period;¹
- ii. Whether the market for Schering-Plough Corporation 6% mandatory convertible Preferred Stock maturing 8/13/2010 (“Schering Preferred Stock” or “Preferred Stock”) was efficient during the Class Period;
- iii. Whether the market for Schering-Plough Corporation put and call options (“Schering Options”) was efficient during the Class Period; and
- iv. Whether the alleged misstatements and omissions in the Complaint were material.

3. In addition, I understand from Plaintiffs’ counsel that loss causation is not an element of proof to be decided as part of Plaintiffs’ class certification motion. Nevertheless, I have been asked, based upon the analysis I performed in the context of evaluating efficiency, to observe whether the elements of loss causation have been satisfied in this matter if Plaintiffs prove the alleged misrepresentations and/or omissions (e.g., the materiality of Defendants’

¹ The putative Class Period is from July 24, 2006 to March 28, 2008 (Amended Consolidated Class Action Complaint (“Complaint”) at ¶ 2).

alleged misstatements and omissions as well as statistically significant investor losses caused by the alleged corrective disclosures).

4. The materials I have relied upon in forming my opinions are summarized in **Appendix A.**

5. Winnemac Consulting is being compensated at an hourly rate of \$450 per hour for my work on this matter and my compensation is in no way contingent on the outcome of this case. My qualifications are described below.

II. QUALIFICATIONS

6. I hold a Bachelors Degree in Economics with Honors from Knox College and a Masters in Public Policy from the University of Chicago. I am also a CFA charter-holder. The CFA, or Chartered Financial Analyst, designation is awarded to those who have sufficient practical experience and complete a rigorous series of three exams over three years that cover a wide variety of financial topics including financial statement analysis and valuation.

7. I, along with several others, founded Winnemac Consulting in March 2008. Prior to starting Winnemac Consulting, I was employed by Chicago Partners for over twelve years where I was responsible for conducting and managing analysis in a wide variety of areas including securities valuation and damages, labor discrimination and antitrust. I have been engaged numerous times as a valuation expert both within and outside the litigation context. My experience in class action securities cases includes work for plaintiffs, defendants, D&O insurers and by a prominent mediator (Retired Judge Daniel Weinstein) to provide economic analysis and opinions in over a dozen securities class actions as well as other matters. As a result of my

involvement in these cases, much of my career has been spent analyzing how quickly, reliably and the degree to which new information impacts securities prices.

8. My qualifications are further detailed in my curriculum vitae, which is attached as **Appendix B**.

III. SUMMARY OF OPINIONS

9. After analyzing Schering Common Stock throughout the Class Period and giving careful consideration to the efficiency factors described in detail throughout this report, I have formed the opinion that the market for Schering Common Stock was efficient throughout the Class Period. This opinion is based upon my analysis described in Section VII, below.

10. After analyzing Schering Preferred Stock throughout the Class Period and giving careful consideration to the efficiency factors described in detail throughout this report, I have formed the opinion that the market for Schering Preferred Stock was efficient throughout the Class Period. This opinion is based upon my analysis described in Section VIII, below.

11. After analyzing Schering Options throughout the Class Period and giving careful consideration to the efficiency factors described in detail throughout this report, I have formed the opinion that the market for Schering Options was efficient throughout the Class Period. This opinion is based upon my analysis described in Section IX, below.

12. The alleged misstatements and omissions in this case were material. I base this opinion on: (1) an analysis of the nature of the alleged misstatements in the context of Schering's business and the importance of the relevant products to Schering's overall value; and (2) event study analyses that indicate that upon the revelation of the alleged misstatements and omissions the market value of both Schering Common Stock and Schering Preferred Stock declined in a

statistically significant manner. Similarly, the holders of Schering Call Options and the sellers of Schering Put Options suffered substantial losses on the alleged corrective disclosure dates.

13. While I understand from Plaintiffs' counsel that loss causation is not to be decided at this phase of the litigation, assuming Plaintiffs' claims are proven to be true, there is a clear economic link between the alleged misrepresentations and omissions and foreseeable investor losses.

14. The event study analyses described herein in Sections VII and VIII provide clear evidence that investor losses were proximately caused by the release of information that Plaintiffs allege was illegally withheld during the Class Period. This opinion is based upon the fact that there were statistically significant negative stock price changes after controlling for market and industry effects for both Schering Common Stock and Preferred Stock concurrent with the release of information that Plaintiffs allege were corrective. Analysis of Schering Options provides further evidence of security holder losses on these allegedly corrective disclosure days. I fail to find confounding information on the alleged corrective disclosure events that would provide a reasonable alternative explanation for these price declines.

15. In addition, prior to the alleged corrective disclosures, the market did not have credible knowledge of the outcome of ENHANCE. While there was some anonymous, unverified speculation in the market regarding the outcome of ENHANCE, including on internet chat rooms such as CaféPharma, the significant price reaction, coupled with my reading of press and analyst coverage surrounding the release of information on the alleged corrective disclosure dates, belies the notion that the ENHANCE results were somehow credibly known or expected prior to their release, and thus already fully reflected in the market price. I have seen no analyst

reports or Company reaction to substantiate the notion that such rumors were taken as credible fact.

16. The remainder of this report is organized as follows: **Section IV** of this report provides an overview of Schering-Plough Corporation (“Schering” or “the Company”) and the claims in this case. **Section V** discusses the reliance requirement and the “fraud on the market” theory. **Section VI** introduces the *Cammer* factors and other factors for evaluating market efficiency under the “fraud on the market” theory. **Section VII** evaluates the *Cammer* factors and other efficiency factors for Schering Common Stock and **Section VIII** evaluates the *Cammer* factors and other efficiency factors for Schering Preferred Stock. **Section IX** examines efficiency for Schering option securities, and **Section X** discusses loss causation.

17. I understand that discovery in this case is ongoing and has not yet been completed. Therefore, I reserve the right to amend this report to reflect new information available to me in light of the ongoing discovery process and/or future rulings from the Court. For example, if I conduct a full damages analysis in a subsequent report in this matter, I anticipate expanding the focus of my work at that time to include further analysis of the facts and claims in this Action, including other events during or after the Class Period that may have caused additional class member losses associated with the events and allegations in the Complaint.

IV. OVERVIEW OF SCHERING, SCHERING'S BUSINESS MODEL, AND PLAINTIFFS' CLAIMS

Company Description

18. Schering develops, manufactures, and markets medical therapies and treatments worldwide.² In May 2000, Schering and another company, Merck & Co., Inc. ("Merck") formed a joint venture, Merck/Schering-Plough Pharmaceuticals ("M/S-P"),³ to jointly develop and market new prescription medicines in cholesterol management. Vytorin (a combination of Merck's Zocor product and Schering's Zetia product) was approved by the FDA in July 2004, and by the end of the year it was for sale in 15 countries.⁴

19. Vytorin and Zetia were important to Schering's financial success. Among other publicly-filed documents, Schering's 2006 and 2007 Forms 10-K acknowledged that "Schering's ability to generate profits and operating cash flow depends largely upon the continued profitability of ... Vytorin and Zetia."⁵ Before and during the Class Period, Vytorin and Zetia accounted for between 60-70% of Schering's earnings per share and was by far Schering's most significant revenue driver.⁶ The total combined sales of Zetia and Vytorin increased from \$3.9 billion in 2006 to \$5.2 billion in 2007.⁷

20. **Exhibit 1** shows quarterly revenue from Zocor, Zetia and Vytorin from 2004 through 2007. Quarterly revenues from Zetia and Vytorin rose swiftly and steadily over this

² 2008 10-K, pp. 3-4.

³ <http://www.merck.com/about/our-history/home.html>; "Trial and Error: Delays In Drug's Test Fuel Wider Data Debate," *The Wall Street Journal*, March 24, 2008.

⁴ 2008 10-K, p. 131.

⁵ 2006 10-K, p. 13 and 2007 10-K, p. 14.

⁶ Complaint at ¶ 82; "Update 1-Schering-Plough CEO to buy \$2 mln in stock," *Reuters*, January 18, 2008 10:35. Schering 10-Qs 2006-2008.

⁷ Complaint at ¶ 83; Merck 8-Ks dated 4/19/2007, 7/23/2007, 10/22/2007 and 1/30/2008, Ex. 99.2.

period. However, the quarterly revenue from Zocor declined precipitously after the patent protection for Zocor expired on June 23, 2006. This loss in revenue is particularly evident in the change in quarterly revenue between the second and the third quarter of 2006.

21. Although Vytorin was approved in 2004, there had been no cardiovascular clinical trials to prove that Vytorin (adding Zetia to Merck's Zocor) offered any benefits in the form of clinical outcomes relative to use of Merck's Zocor alone. ENHANCE (Effect of Combination Ezetimibe and High-Dose Simvastatin vs. Simvastatin Alone on the Atherosclerotic Process in Patients with Heterozygous Familial Hypercholesterolemia) was the first such study designed to measure Vytorin's effect relative to Zocor on patient health and well-being (as distinguished from only examining Vytorin's ability to reduce LDL cholesterol).⁸

22. ENHANCE began in 2002 with the primary endpoint of the study to determine whether Vytorin was more effective than Zocor alone in reducing plaque build-up in the arteries.⁹ The study included 720 patients with a condition predisposing them to high cholesterol who were given either Vytorin or simvastatin (generic Zocor).¹⁰ ENHANCE focused on the thickness of the artery wall which was intended to serve as a proxy to assess cardiovascular clinical event outcomes, such as the effectiveness of the drugs at lowering the risk of heart attack and stroke.¹¹

⁸ "Q1 2007 Schering-Plough Earnings Conference Call – Final," *Voxant FD WIRE*, April 19, 2007; "Event Brief of Q2 2007 Schering-Plough Conference Call – Final," *Voxant FD WIRE*, July 23, 2007.

⁹ Schering 2007 10-K, p. 23: "The primary endpoint was the mean change in the intima-media thickness measured at three sites in the carotid arteries (the right and left common carotid, internal carotid and carotid bulb) between patients treated with ezetimibe/simvastatin versus patients treated with simvastatin 80 alone over a two-year period."

¹⁰ "2nd Update: Vytorin Fails To Benefit Artery Vs. Statin Drug," *Dow Jones News Service*, January 14, 2008, 13:58.

¹¹ "Merck/Schering Pharmaceuticals Provides Results of the ENHANCE Trial," *Business Wire*, January 14, 2008, 08:05; "2nd Update: Vytorin Fails To Benefit Artery Vs. Statin Drug," *Dow Jones News Service*, January 14, 2008, 13:58.

23. The drug trial garnered intense investor interest because Vytorin and Zetia had annual sales of about \$5 billion, and if Vytorin did not have a marked cardiovascular beneficial outcome relative to Zocor, there might be little justification for doctors to prescribe the more expensive Vytorin or Zetia instead of a generic simvastatin or other competitor drugs, many of which had proven cardiovascular outcome trials.¹² For example, on December 12, 2007, *The New York Times* observed that “[i]ndependent scientists have viewed ENHANCE as crucial because it is the first trial that would answer whether Zetia’s ability to lower cholesterol has real biological benefits for patients.”¹³

24. The corrective information became known to the market on certain dates between December 2007 and March 2008, with the full and detailed results of ENHANCE not fully disclosed until the end of March 2008. For instance, after the market closed on December 11, 2007, *Reuters* revealed that U.S. lawmakers were investigating Schering and Merck “on allegations that the drug makers were withholding data from a study that may change how doctors treat high cholesterol.”¹⁴ The article noted that “[c]ardiologists have been clamoring for full results from the ENHANCE trial, which involved some of the industry’s best-selling cholesterol-lowering drugs.” Also, the next day, Cowen & Company issued an analyst report in which the analyst opined that any weakness in Schering’s stock price due to ENHANCE presented a “buying opportunity.”¹⁵ In response to this news, Schering Common Stock dropped

¹² According to drugstore.com, 80mg of generic simvastatin cost roughly \$1 per pill, compared with about \$4 per 10/80mg Vytorin tablet. See, “2nd Update: Vytorin Fails To Benefit Artery Vs. Statin Drug,” *Dow Jones News Service*, January 14, 2008, 13:58.

¹³ “House Panel Scrutinizes Trial of Drug,” *The New York Times*, December 12, 2007.

¹⁴ Complaint at ¶ 360; “UPDATE 1-Merck, Schering-Plough cholesterol trial faces probe,” *Reuters News*, December 11, 2007, 21:49.

¹⁵ “Quick Take: ENHANCE Congressional Hearing News Today But Not Likely To Linger,” *Cowen & Company*, December 12, 2007.

3.66%, Schering Preferred Stock dropped 2.58%, the total value of Schering Call Options dropped 12.17%, and the total value of Schering Put Options increased (thus harming sellers) by 36.22% on December 12, 2007.¹⁶

25. On January 14, 2008, M/S-P issued a press release providing partial (“top-line”) results for ENHANCE which indicated that Vytorin did not meet the primary endpoint.¹⁷ The news was received negatively by the market, and after the press release, *Reuters* published an article attributing the Company’s rapidly declining share price to its disclosure regarding ENHANCE.¹⁸ That day, Schering Common Stock fell 7.97%, Schering Preferred Stock dropped 5.64%, the total value of Schering Call Options dropped 36.37%, and the total value of Schering Put Options increased (thus harming sellers) by 44.02%

26. Schering’s stock price continued to decline the next day, January 15, 2008, as more reports about the safety and efficacy of Vytorin entered the market. Steven E. Nissen, chairman of cardiovascular medicine at the Cleveland Clinic, stated in *The Wall Street Journal* that “physicians should now stop using [Zetia] or Vytorin as a primary therapy for patients with high cholesterol.”¹⁹ Another news report noted “that a failed clinical trial could dampen demand for the company’s blockbuster Vytorin cholesterol drug.”²⁰ Also, CBS reported that Congress

¹⁶ For a given change in stock price, holding all else constant, option prices will change less in dollar terms than common stock, but more in percentage terms. Therefore, it is unsurprising that the percentage change in option price is greater than the percentage change in stock price.

¹⁷ “Merck/Schering-Plough Pharmaceuticals Provides Results of the ENHANCE Trial,” *Business Wire*, January 14, 2008, 08:05.

¹⁸ “UPDATE 2-Schering, Merck cholesterol drug misses goal,” *Reuters News*, January 14, 2008, 09:43.

¹⁹ “Study Deals Setback to Vytorin Cholesterol Drug,” *The Wall Street Journal*, January 15, 2008.

²⁰ “UPDATE 1-Schering-Plough selloff worsens on Vytorin concern,” *Reuters News*, January 15, 2008, 14:29.

was investigating why the FDA approved Vytorin.²¹ On that day, Schering Common Stock declined by 6.8%, Schering Preferred Stock dropped 4.57%, the total value of Schering Call Options dropped 32.46%, and the total value of Schering Put Options increased (thus harming sellers) by 39.53%.

27. After the market close on January 16, 2008, *The Wall Street Journal* reported that Congress was investigating advertising for Vytorin, suspecting that the Company knew the results of ENHANCE yet continued to suggest that Vytorin had an advantage over generic statins.²² In addition, a law firm announced that it was investigating the marketing for Vytorin and Zetia.²³ On the next day, January 17, 2008, Schering Common Stock fell another 7.96%, Schering Preferred Stock dropped 6.36%, the total value of Schering Call Options dropped 33.47%, and the total value of Schering Put Options increased (thus harming sellers) by 45.24%.

28. The full, detailed ENHANCE results were ultimately disclosed at the American College of Cardiology conference in Chicago on Sunday, March 30, 2008, and through a press release the next day. Lead author of the *New England Journal of Medicine* article, Dr. Kastelein said, “What we’ve now added is every imaginable secondary endpoint and exploratory analysis. However you turn the data, there is nothing.”²⁴ Dr. Harlan Krumholz of Yale University stated that “[o]ur strongest recommendation is that people need to go back to statins.”²⁵ He also stated that since Vytorin is “a new drug with a novel mechanism,” it is not known whether it is safe (*i.e.* raising heart attack and stroke risk) much less addressing the practical question of lowering heart

²¹ “Profile: Congress now looking into why FDA approved Vytorin; Congressman Bart Stupak discusses the investigation,” *CBS News: The Early Show*.

²² “WSJ: Congress Investigating Vytorin Ads,” *Dow Jones News Service*, January 16, 2008, 16:25.

²³ “Hagens Berman Sobol Shapiro Announces Investigation Into Marketing of Vytorin and Zetia,” *PR Newswire*, January 16, 2008, 21:52.

²⁴ “Vytorin study still leaves questions unanswered,” *Reuters News* March 30, 2008, 13:04.

²⁵ “Vytorin expert panel says ‘go back to statins’,” *Reuters News*, March 30, 2008, 18:57.

attack and stroke risk. In addition, this sentiment was the majority opinion as evidenced by “[p]anelist Dr. Joseph Messer, a cardiologist from Chicago, [who] said the panel’s recommendations reflect a consensus.”²⁶ The next day, March 31, 2008, Schering Common Stock fell 25.99%, Schering Preferred Stock dropped 20.54%, the total value of Schering Call Options dropped 71.22%, and the total value of Schering Put Options increased (thus harming sellers) by 109.64%.²⁷

29. The release of the ENHANCE results also caused a precipitous decline in prescriptions for both Vytorin and Zetia. As the table below shows, the total U.S. prescription volume for Vytorin and Zetia fell by 27.68% and 25.18%, respectively, from January 2008 to June 2008.²⁸

Total Prescription Volume for ZETIA and VYTORIN							
(in Thousands)							
	January	February	March	April	May	June	% Change
	2008	2008	2008	2008	2008	2008	(Jan. vs. June)
VYTORIN	1,839	1,597	1,610	1,420	1,404	1,330	-27.68%
ZETIA	1,366	1,176	1,193	1,072	1,060	1,022	-25.18%
Total Merck/Schering-Plough Franchise	3,205	2,773	2,803	2,492	2,463	2,352	-26.61%
Source: Schering 8-K, IMS' National Prescription Audit Plus (NPA+) as of July 15, 2008.							

Plaintiffs’ Allegations

30. The Complaint alleges that although the Defendants knew or recklessly disregarded from at least the beginning of the Class Period that the results from ENHANCE were

²⁶ “Vytorin expert panel says ‘go back to statins’,” *Reuters News*, March 30, 2008, 18:57.

²⁷ The value of a put option increases when the stock price falls. Therefore, there is no bound on the daily percentage change in the value of a put option. *See* Section IX.

²⁸ Schering-Plough Form 8-K dated July 17, 2008; IMS National Prescription Audit Plus (NPA+) as of July 15, 2008.

disappointing, they failed to inform the market of those results.²⁹ The Complaint sets forth claims under Sections 10(b), 20(a) and 20A of the Exchange Act in connection with material misrepresentations and omissions concerning Zetia, Vytorin, and ENHANCE. The Complaint separately sets forth certain non-fraud claims under Sections 11, 12(a)(2) and 15 of the Securities Act in connection with material misrepresentations and omissions in the disclosures related to Schering's August 9, 2007 issuance of 57,500,000³⁰ shares of common stock at \$27.50 per share and August 10, 2007 issuance of 10,000,000 shares of 6.00% mandatory convertible preferred stock at \$250 per share (collectively referred to as the "Offering").³¹

31. Schering withheld material information concerning the ENHANCE results from the market based on purported problems with the data, but allegedly continued to issue highly positive (mis)statements regarding Zetia and Vytorin.³² Throughout the Class Period, Defendants emphasized that Vytorin was superior to competing statin products, such as Pfizer's Lipitor and

²⁹ Complaint at ¶ 8.

³⁰ See Prospectus Supplement to Prospectus Dated August 2, 2007. Schering issued 50M common shares on August 9, 2007 through a secondary offering. The underwriters exercised an option to buy up another 7.5M common shares.

³¹ Documents related to the supplemental listing application for the Preferred Stock offering indicate that there were an additional 1.5 million shares potentially available in that offering as an overallotment. According to the prospectus, "To the extent the underwriters sell more than 10,000,000 shares of the 2007 Preferred Stock, the underwriters **have the option** to purchase up to 1,500,000 additional shares of the 2007 Preferred Stock from Schering-Plough at the initial price to the public, less the underwriting discounts, within 30 days from the date of this prospectus supplement" (emphasis added). An overallotment provides a means for the underwriters to successfully raise the desired funds, in this case, 10 million shares at \$250. By overselling shares, an underwriter may protect itself from circumstances such as when a purchase cannot be completed. (See BA_0000215 – BA_0000216 and MSP-CIVAE0056604 - MSP-CIVAE0056617.) The document "Purchasers in the August 2007 Schering-Plough Mandatory Convertible Preferred Offering" (GS_0021687 - GS_0021695) indicates that a total of 11,397,465 shares were sold to the public. Schering's 2007-2009 Form 10-K SEC filings, however, indicate that there were only 10 million preferred shares outstanding.

³² Complaint at ¶ 10.

AstraZeneca's Crestor, due to its superior ability to lower cholesterol, and declared that the science favored Vytorin and Zetia.³³

32. The Complaint alleges that by delaying the release of the ENHANCE results, Schering was able to reap billions of dollars in sales of Zetia and Vytorin that would not have been made had the results from ENHANCE been publicized earlier. This enabled Schering to falsely project billions of dollars in future revenue tied to these drugs despite Schering knowing or recklessly disregarding the truth about ENHANCE, and resulted in the artificially inflated market price of Schering's publicly-traded securities during the Class Period.³⁴

V. DISCUSSION OF THE RELIANCE REQUIREMENT

33. Class members' reliance on the alleged misstatements and omissions is a required element of liability for Plaintiffs' Exchange Act claims. Plaintiffs assert the "fraud on the market" theory of reliance in this matter. The "fraud on the market" theory is based on the notion that in an efficient market (one in which widely-available public information is quickly incorporated into the market price), all purchasers implicitly rely on any misrepresentations or omissions since the value of those misrepresentations or omissions is incorporated into each class member's purchase price. The "fraud on the market" theory was first addressed by the U.S. Supreme Court in *Basic v. Levinson*:

In an open and developed securities market, the price of a company's stock is determined by the available material information regarding the company and its business... Misleading statements will therefore defraud purchasers of stock even if the purchasers do not directly rely on the misstatements... The causal connection between the defendants' fraud and

³³ Complaint at ¶ 88.

³⁴ Complaint at ¶ 12.

the plaintiffs' purchase of stock in such a case is no less significant than in a case of direct reliance on misrepresentations.³⁵

34. As indicated in *Basic*, in an open, developed and efficient market, prices reflect what is known about a company. If a company provides the market with misleading information regarding its financial strength or business practices, the market price will be inflated compared to what the price would have been if the truth were known (but-for misleading information). Thus, in an efficient market where plaintiffs prove there were material misrepresentations, all purchasers implicitly relied on those misrepresentations.

35. Determining whether the market for a security was "open and developed" or "efficient" to the degree required for a presumption of reliance under the "fraud on the market" theory is an empirical exercise. The esteemed economist Dr. Eugene Fama, in his seminal research, first outlined definitions of an "efficient market."³⁶ He described different levels of efficiency which he called "weak-form," "semi-strong-form" and "strong-form" efficiency.³⁷

36. The market efficiency standard adopted by *Basic* as necessary for the presumption of reliance conforms to Dr. Fama's "semi-strong form" efficiency. "Semi-strong form" efficiency implies that all widely available public information is reflected in a stock's current

³⁵ *Basic v. Levinson*, 485 U.S. 224, 240 (1988).

³⁶ Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, Vol. 25, 1970, p. 383.

³⁷ "Weak-form" efficiency requires that historical prices are not predictive of future prices. Under this form of efficiency, excess returns cannot be earned using strategies based on historical prices. Therefore, technical analysis will not produce consistent excess returns over time. "Semi-strong form" efficiency implies that all public information is reflected in a stock's current market price. Security prices adjust to new publicly available information rapidly and in an unbiased fashion so that it is impossible to earn excess returns by trading on that information. Under this form of efficiency, neither fundamental nor technical analysis can produce consistent excess returns. "Strong-form" efficiency implies all information in the market, whether public or private, is accounted for in the market price. In this market, investors cannot consistently earn excess returns over a long period of time even if they have inside information.

market price.³⁸ This implies that security prices adjust to new publicly available information rapidly and in an unbiased fashion so that it is impossible to earn excess returns by trading on that information. *Basic* stated: “In an open and developed securities market, the price of a company’s stock is determined by the available material information regarding the company and its business.”³⁹ The Supreme Court’s effective adoption of the “semi-strong form” efficiency standard is economically sensible because it recognizes that insiders often possess non-public information and that securities prices do not necessarily reflect this non-public information, but that to presume reliance, the market price must reflect all publicly available information.

37. In the next Section, I discuss the factors that are regularly considered by Courts in determining whether the market for a particular security is efficient.

VI. CAMMER FACTORS

38. In *Cammer v. Bloom*, the Court identified the following factors as relevant to the determination of whether an efficient market exists for a given security: 1) average weekly trading volume, 2) analyst coverage, 3) market makers, 4) SEC Form S-3 eligibility, and 5) price reaction to unexpected information.⁴⁰

³⁸ Eugene F. Fama, “Efficient Capital Markets: A Review of Theory and Empirical Work.” *The Journal of Finance* Vol. 25, 1970, p. 388 (italics original): “First, however, we should note that what we have called *the* efficient markets model in the discussions of earlier sections is the hypothesis that security prices at any point in time ‘fully reflect’ *all* available information. Though we shall argue that the model stands up rather well to the data, it is obviously an extreme null hypothesis. And, like any other extreme null hypothesis, we do not expect it to be literally true. The categorization of the tests into weak, semi-strong, and strong form will serve the useful purpose of allowing us to pinpoint the level of information at which the hypothesis breaks down. And we shall contend that there is no important evidence against the hypothesis in the weak and semi-strong form tests (i.e., prices seem to efficiently adjust obviously publicly available information).”

³⁹ *Basic v. Levinson*, 485 U.S. 224, 240 (1988).

⁴⁰ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989).

39. The *Cammer* decision relied on Bromberg and Lowenfels' definition of efficiency.⁴¹ As articulated below, the adopted definition of efficiency is clearly consistent with Fama's definition of "semi-strong" efficiency.⁴² For the purposes of this exercise, I adopt Bromberg and Lowenfels' definitions for the terms "open," "developed," and "efficient" as described below:

An open market is one in which anyone, or at least a large number of persons, can buy or sell.

A developed market is one which has a relatively high level of activity and frequency, and for which trading information (e.g., price and volume) is widely available. It is principally a secondary market in outstanding securities. It usually, but not necessarily, has continuity and liquidity (the ability to absorb a reasonable amount of trading with relatively small price changes).

An efficient market is one which rapidly reflects new information in price.

These terms are cumulative in the sense that a developed market will almost always be an open one. And an efficient market will almost invariably be a developed one.⁴³

40. While there is a clear and well-accepted economic theory of market efficiency, there are no broadly accepted bright-line empirical tests that allow one to classify a particular market as "efficient" or "inefficient." In my view, the *Cammer* decision identified important metrics to consider when evaluating efficiency for purposes of the "fraud on the market" theory.

41. In the subsequent sections I evaluate each of the *Cammer* factors, as well as the following additional factors that are relevant to assessing market efficiency: 1) market

⁴¹ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989). Lewis Lowenfels is a long-time practicing corporate securities attorney and Alan Bromberg is Distinguished Professor of Law at the SMU Dedman School of Law. They wrote "Securities Fraud and Commodities Fraud" currently in its 7th edition.

⁴² Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance* Vol. 25, 1970, p. 383.

⁴³ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989) (citing Bromberg and Lowenfels, *Securities Fraud and Commodities Fraud*, § 8.6 (Aug. 1988)) (emphasis added).

capitalization, 2) bid-ask spread, 3) the fraction of shares held by institutional investors, and 4) autocorrelation (meaning whether there is a pattern in a security's returns so that past returns have the ability to predict future returns).

42. In Section VII, I empirically evaluate each factor for the Common Stock during the putative Class Period. In Section VIII, I empirically evaluate each factor for the Preferred Stock.

VII. APPLICATION OF EFFICIENCY FACTORS TO SCHERING COMMON STOCK

A. OVERVIEW

43. After giving careful consideration to each of the efficiency factors described in detail below, I find that each factor supports my opinion that the market for Common Stock was efficient throughout the Class Period.

44. My analyses and related conclusions concerning the factors relevant to a finding of market efficiency for the Common Stock throughout the Class Period are discussed below. In addition to the discussion below, **Exhibit 2** shows that for each of the factors examined, the empirical evidence supports a finding that the Common Stock traded in an efficient market. As further background to my analyses, **Exhibit 3** displays the Common Stock closing price and trade volume for each day throughout the Class Period.

45. In summary, and as discussed more fully below, the Common Stock traded in an efficient market. First, the average weekly trading volume of the Common Stock far exceeds benchmarks that the Courts have established. During the Class Period, Schering Stock traded on the NYSE where the Common Stock average **daily** trade volume was **11.4 million shares**. This is a tremendous quantity of shares trading hands, and as I will demonstrate, this is extremely high

relative to other common stocks traded on the NYSE. Second, there was an abundance of securities analysts following and reporting on Schering. Third, Schering was S-3 eligible. Fourth, Schering Common Stock had one of the largest market capitalizations of all firms on the NYSE and NASDAQ. Fifth, Schering Stock had a relatively low bid-ask spread. Sixth, Schering Common Stock actively traded on the NYSE, fulfilling the *Cammer* factor regarding market makers. Seventh, there was no evidence of autocorrelation during the Class Period. Eighth, institutions, which are considered sophisticated and well-informed investors, held over three-quarters of shares outstanding. Finally, there was also a strong cause and effect relationship between new Company-specific information and the market price of Common Stock during the Class Period. These factors all support the conclusion that Schering Common Stock traded in an open, developed, and efficient market throughout the Class Period.

B. CAMMER FACTOR 1: AVERAGE WEEKLY TRADING VOLUME

46. The first *Cammer* factor is the average weekly trading volume of a security.

According to one authority cited by the *Cammer* court,

[T]urnover measured by average weekly trading of 2% or more of the outstanding shares would justify a strong presumption that the market for a security is an efficient one; 1% would justify a substantial presumption.⁴⁴

47. Volume as a fraction of shares outstanding is an important indicator of market efficiency. First, volume is objectively quantifiable and comparable across securities. Second, high volume is generally indicative of continuity, liquidity, and market depth – which are highly

⁴⁴ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989) (citing Bromberg and Lowenfels, Securities Fraud and Commodities Fraud, § 8.6 (Aug. 1988)).

indicative of market efficiency.⁴⁵ Third, substantial volume would indicate there is likely a market for the collection and distribution of information about the security. As Thomas and Cotter explain, “Trading volume was also considered as an eligibility standard because it affects information dissemination to the market, and was an important criterion for investment analysts in deciding which stocks to follow.”⁴⁶

48. Schering Common Stock easily surpasses the higher 2% threshold level of average weekly trading volume necessary for an efficient market. The average weekly turnover for the Common Stock was 3.65%. **Exhibit 4** plots the Common Stock’s trading volume as a fraction of shares outstanding for each week during the Class Period.⁴⁷ Indeed, the average *daily* volume during the Class Period was 11.364 million shares. The volume of trading for the Common Stock supports the conclusion that the market for this security was efficient throughout the Class Period.

49. Another measure of the concepts underlying this *Cammer* factor (continuity, liquidity, and market depth) is annualized turnover velocity, which is essentially the first

⁴⁵ Continuity means that trades may occur at any time. Liquidity in this context means that investors can convert cash into shares or shares into cash at a price similar to that of the prior trade (assuming no new information). William F. Sharpe, Gordon J. Alexander, and Jeffery V. Bailey, *Investments*, Prentice Hall, Fifth Edition, 1995, pp. 44-45. Bromberg and Lowenfels define a market that has continuity and liquidity as “the ability to absorb a reasonable amount of trading with relatively small price changes.” Bromberg and Lowenfels, *Securities Fraud and Commodities Fraud*, § 8.6 (Aug. 1988) as cited by *Cammer*, p. 2. Market depth refers to the number of shares that can be traded at quoted prices. A deep market will have significant orders on the buy and sell side so that the market can experience a relatively large market order without greatly altering the market price. See Yakov Amihud, Haim Mendelson and Lasse Heje Pedersen, 2006, “Liquidity and Asset Prices,” *Foundations and Trends in Finance* Vol. 1(4) pp. 269-364.

⁴⁶ Randall S. Thomas and James F. Cotter, “Measuring Securities Market Efficiency in the Regulatory Setting,” *Law and Contemporary Problems*, Vol. 63, p. 108. Randall Thomas holds a Ph.D. in Economics and a J.D. in Law and is The John Beasley Professor of Law and Business at Vanderbilt Law School and the Owen School of Business at Vanderbilt University. James Cotter holds a Ph.D. in Finance and is the Benson-Pruitt Associate Professor of Finance at Wake Forest University's Calloway School of Business.

⁴⁷ For the purposes of this analysis, a “trading week” consists of 5 consecutive trading days (this may not follow the calendar week).

Cammer factor expressed in dollar terms.⁴⁸ The advantage of this measure is that Schering Common Stock's annualized turnover velocity can be compared directly with other stocks that trade on the same exchange. The average annualized turnover velocity ratio for Schering Common Stock was 112%, 181% and 340% in 2006, 2007 and 2008 compared with the NYSE average of 134%, 167% and 240% respectively.⁴⁹ Thus, the Common Stock had an average annualized turnover velocity that is comparable to or higher than the average for the NYSE during the Class Period.

50. In short, the relatively high trading volume in the Common Stock throughout the Class Period supports the conclusion that the market for this security was efficient.

C. CAMMER FACTOR 2: ANALYST COVERAGE

51. The *Cammer* decision stated the following related to analyst coverage:

...it would be persuasive to allege a significant number of securities analysts followed and reported on a company's stock during the class period. The existence of such analysts would imply, for example, the [auditor] reports were closely reviewed by investment professionals, who would in turn make buy/sell recommendations to client investors.⁵⁰

52. Analyst coverage, while not required for market efficiency in my opinion, is important confirmatory evidence of efficiency. Significant analyst coverage implies that there is sufficient interest in a company and its securities, that there is an active market for information regarding the company and its securities and that the information is widely distributed.

⁴⁸ Turnover velocity is simply the average turnover (the first *Cammer* factor) expressed in dollar terms: **Turnover Velocity Ratio** = (Volume x Price) / (Shares Outstanding x Price) = Dollars Traded / Dollars Outstanding

⁴⁹ Turnover velocity for the NYSE is from World Federation of Exchanges, <http://www.world-exchanges.org/statistics>. For purposes of this calculation, I weight each annual turnover velocity to reflect the fraction of the year included in the Class Period.

⁵⁰ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989).

53. During the Class Period, there was an abundance of analyst coverage of Schering. **Exhibit 5** shows that there were at least 235 analyst reports issued during the Class Period by 18 separate equity analysts for Schering.⁵¹ Major firms such as AG Edwards, Credit Suisse and Deutsche Bank issued analyst reports on Schering. These reports served the purpose of disseminating publicly available information along with commentary, news, updates, analysis and recommendations of the analysts to investors. In addition, there were reports by credit rating agencies and others that evaluated Schering's creditworthiness and publicly-traded securities. The extensive coverage of Schering by securities analysts supports the conclusion that the Common Stock traded in an efficient market throughout the Class Period.

54. Since 1989 when the *Cammer* decision was published, there has been an explosion of alternative methods by which publicly available information about publicly-traded securities is disseminated to investors. For example, since the *Cammer* decision, through the Internet, 24-hour cable news networks, email, RSS feeds,⁵² and other media, the ability of individual and institutional investors to obtain information about publicly-traded securities and the market in general has revolutionized the manner in which investors and investment professionals receive and process information.

55. Moreover, information regarding the market price, the current bid-ask spread, and the ability to trade online is available almost instantaneously via the Internet for anyone with an

⁵¹ This almost certainly understates the total amount of analyst coverage since many analyst reports are not available through third party data providers.

⁵² RSS is an acronym for Really Simple Syndication or Rich Site Summary. RSS files are formed as XML files and are designed to provide content summaries of news, blogs, forums or website content. The RSS feeds are generally simple headlines and brief descriptions with links to additional information. Content viewed in the RSS reader or news aggregator is known as an RSS feed. RSS is becoming increasingly popular since it is a free and easy way to promote a site and its content without the need to advertise or create complicated content sharing partnerships. (<http://www.rss-specifications.com/> and <http://www.rss-specifications.com/what-is-rss.htm>)

online brokerage account. Thus, in addition to the substantial analyst coverage of Schering, there were many other sources of information dissemination. For example, there was substantial public press regarding Schering. A search for articles classified as related to Schering by Factiva over the Class Period results in over 2,300 articles. There were 326 SEC filings that are available online at EDGAR at no out-of-pocket cost.⁵³ There were numerous other sources of information available throughout the Class Period that I do not attempt to quantify. The degree of news coverage and publicly available information further supports the conclusion that there was substantial supply and demand for information regarding Schering in the public arena throughout the Class Period.

56. In summary, the number of analyst reports, other investment reports covering Schering and its other publicly-traded securities, and the substantial public dissemination of news and other information regarding Schering provides evidence (i) of a robust and active market for information about Schering, and (ii) that the Common Stock traded in an efficient market.

D. CAMMER FACTOR 3: MARKET MAKERS

57. The third *Cammer* factor states:

For over the counter markets without volume reporting, the number of market makers is probably the best single criterion. Ten market makers for a security would justify a substantial presumption that the market for the security is an efficient one; five market makers would justify a more modest presumption.⁵⁴

⁵³ Excludes SEC Form 3, 4 and 5, which relate only to equity ownership by directors, officers, and owners of more than ten percent of a class of the company's equity.

⁵⁴ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989) (emphasis added).

58. The basic premise that the number of market makers can serve as an efficiency criteria relates to the notion that market makers are:

...presumably knowledgeable about the issuing company and the stocks' supply and demand conditions (i.e., the "order flow"). Therefore, it is believed the larger the number of market makers in a given security, the more information is available about it and the quicker its dissemination in the price.⁵⁵

59. As noted above, *Cammer* states that the number of market makers is relevant to consider the market efficiency of securities traded in an over the counter market with no volume reporting. On such markets, there may be reason for concern regarding liquidity and information dissemination. However, these concerns are generally not applicable to stocks trading on large, modern exchanges such as the NYSE which are often assumed to be efficient,⁵⁶ report volume and trade details, and tend to have rules that virtually guarantee a liquid market.⁵⁷

60. Throughout the Class Period, the Common Stock traded on the NYSE, which is a more advanced and efficient market than an over the counter market as described for this *Cammer* factor. The NYSE is one of the largest and most liquid security exchanges in the world with billions of shares traded each day. Rather than decentralized market makers providing liquidity for trading (as for the security at issue in *Cammer*), the NYSE conducts trading on a continuous auction system where an assigned specialist is physically present at all times during open trading. These "specialists" are required by exchange rules to maintain a "fair and orderly"

⁵⁵ Brad M. Barber, Paul A. Griffin and Baruch Lev, "The Fraud-on-the-Market Theory and the Indicators of Common Stocks' Efficiency," *The Journal of Corporation Law*, Winter 1994, 19 Iowa J. Corp. L. 285.

⁵⁶ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989) (citing Bromberg and Lowenfels, *Securities Fraud and Commodities Fraud*, § 8.6 (Aug. 1988)).

⁵⁷ For example, there are rules for minimal market capitalization and specialists are *required* to maintain orderly market. See <http://www.nyse.com/equities/nyseequities/1166830723427.html>; William F. Sharpe, Gordon J. Alexander and Jeffery V. Bailey, *Investments*, Prentice Hall, Fifth Edition, 1995, pp. 45-53; Frank J. Fabozzi, Franco Modigliani, Frank J. Jones, *Foundations of Financial Markets and Institutions*, Prentice Hall, Fourth Edition, 2010, Chapter 18 – Appendix A.

market and to take the other side of a trade even if it means having to buy or sell from their own accounts.⁵⁸ The specialist system thus provides continuous liquidity for the security. In addition, much of the trading (currently a vast majority) is accomplished by electronically matching orders without the involvement of a specialist or market makers at all.⁵⁹

61. The NYSE has a market structure that combines both an auction system and electronic trading and does not rely on the less efficient mechanism of decentralized market makers to provide liquidity. Therefore, the number of “market makers” itself is not a relevant metric; however, Schering Common Stock, by virtue of trading on the NYSE, easily meets the spirit of this *Cammer* factor throughout the Class Period.

E. CAMMER FACTOR 4: SEC FORM S-3 ELIGIBILITY

62. The fourth *Cammer* factor is SEC Form S-3 Eligibility:

It would be helpful to allege the Company was entitled to file an S-3 Registration Statement in connection with public offerings or, if ineligible, such ineligibility was only because of timing factors rather than because the minimum stock requirements set forth in the instructions to Form S-3 were not met. Again, it is the number of shares traded and value of shares outstanding that involve the facts which imply efficiency.⁶⁰

63. Through Form S-3s, the SEC allows certain companies that have previously provided sufficiently high level of public information to incorporate prior SEC filings by reference into current filings and not repeat the information, since it is already deemed to be

⁵⁸ William F. Sharpe, Gordon J. Alexander and Jeffery V. Bailey, *Investments*, Prentice Hall, Fifth Edition, 1995, pp. 45-53; Frank J. Fabozzi, Franco Modigliani, Frank J. Jones, *Foundations of Financial Markets and Institutions*, Prentice Hall, Fourth Edition, 2010, Chapter 18 – Appendix A.

⁵⁹ Frank J. Fabozzi, Franco Modigliani, Frank J. Jones, *Foundations of Financial Markets and Institutions*, Prentice Hall, Fourth Edition, 2010, Chapter 18 – Appendix A.

⁶⁰ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989).

widely publicly available.⁶¹ Eligibility to file a Form S-3 is confirmatory evidence of efficiency, not a requirement. Interpreted in this way, the standard makes sense as an indicator of efficiency.

64. Schering was S-3 eligible and, in fact, when registering the Preferred Stock at issue in this case, Schering did so by incorporating its prior SEC filings by reference.⁶²

65. Schering also filed a Form S-3ASR, which is an automatic shelf registration statement for use by well-known seasoned issuers.⁶³ A Form S-3ASR allows a company to register unspecified amounts of different specified types of securities using a single form.

66. As discussed above, Schering filed Form S-3s throughout the Class Period and met the SEC's standards as a seasoned issuer for which information is already widely distributed. Therefore, Schering meets this *Cammer* efficiency factor which supports the conclusion that the Common Stock traded in an efficient market.

F. CAMMER FACTOR 5: PRICE REACTION TO NEW INFORMATION

67. The fifth *Cammer* factor relates to how a security reacts to new information and states:

...one of the most convincing ways to demonstrate [market] efficiency would be to illustrate, over time, a cause and effect relationship between company disclosures and resulting movements in stock price.⁶⁴

⁶¹ To be eligible to issue a Form S-3, among other things a company must be subject to the Securities Exchange Act of 1934 reporting requirements for more than one year. In addition, the company must have filed all documents in a timely manner for the past twelve months and must show that it has not failed to pay dividends or sinking funds nor defaulted on debts or material leases. See www.sec.gov/about/forms/forms-3.pdf.

⁶² See 6.00% Mandatory Convertible Preferred Stock Prospectus Supplement dated August 2, 2007, Schering-Plough Corp., SEC Form S-3 dated February 12, 1996, SEC Form S-3 dated September 27, 1996, SEC Form S-3 dated June 30, 1997, SEC Form S-3 dated February 5, 2003, and Schering-Plough Corp. amended SEC Form S-3 dated May 13, 2003.

⁶³ Schering-Plough Corp. SEC Form S-3ASR dated August 2, 2007.

⁶⁴ *Cammer v. Bloom*, 711 F. Supp 1264 (D.N.J. 1989).

68. Establishing a causal connection between new company-specific news events and movements in the market price is convincing evidence of market efficiency. A technique often relied upon by academics, both inside and outside of the context of litigation, to establish such a causal connection is called the “event study.” An event study is a well-accepted statistical method utilized to isolate the impact of information on market prices.⁶⁵ Indeed, academics have used event studies as one tool for evaluating the efficient market hypothesis in the first place. Event studies have now been used for over 30 years and appeared in hundreds if not thousands of academic articles as scientific evidence in evaluating how new information affects securities prices.⁶⁶

69. Based on the event study I have performed, I find that there is a clear cause and effect relationship between new material public information about Schering and the market price of its common stock. As just one example, before the market opened on January 14, 2008, M/S-P issued a press release providing partial, top-line results for ENHANCE which indicated that Vytorin did not meet the primary endpoint.⁶⁷ On that day, the Common Stock market price fell by 7.97% while the S&P 500 rose by 1.09% and the S&P 500 Pharmaceutical Index (without Schering and Merck) declined by 1.14%. As detailed below, I performed an event study that shows this decline is too large to be explained by random price movement after controlling for broad market and industry effects (the t-statistic for the Common Stock decline was -5.84 and the t-statistic for the Preferred Stock decline was -4.94).

⁶⁵ David I. Tabak and Frederick C. Dunbar, “Materiality and Magnitude: Event Studies in the Courtroom,” Ch. 19, *Litigation Services Handbook, The Role of the Financial Expert*, Third Edition, 2001.

⁶⁶ John Binder, “The Event Study Methodology Since 1969,” *Review of Quantitative Finance and Accounting*, Vol. 11, 1998, pp. 111-137.

⁶⁷ “Merck/Schering-Plough Pharmaceuticals Provides Results of the ENHANCE Trial,” *Business Wire*, January 14, 2008, 08:05.

70. The market also quickly incorporated unexpected positive news about Schering into the Common Stock price. For instance, on November 8, 2007, Schering's Common Stock price rose 4.12% on news that Schering's experimental anti-tumor drug had been shown to significantly aid in patient improvement.⁶⁸ The market and industry were essentially flat that day, predicting flat returns for Schering, meaning that the entire price increase was attributable to the news. The abnormal return for this day is more than 3 standard deviations from the zero (i.e. the t-statistic is greater than 3), thus indicating the price increase is statistically significant.

71. I identified dozens of events during the Class Period where new Company-specific news resulted in statistically significant price movements during the Class Period. Additionally, there were only a few (no more than statistically expected) significant price movements for which I could find no material news. This implies that there is a scientifically demonstrable cause and effect relationship between newly available Schering specific news and changes in the price of the Common Stock during the Class Period, and provides strong scientific evidence that the Common Stock traded in an efficient market. The remainder of this Section provides a description of relevant event study methodologies generally and the particular methodology I applied for purposes of this report.

72. An event study is a technique used to measure the effect of new information on the market prices of a company's publicly traded securities. New information may include, for example, company press releases, earnings reports, SEC filings, news reports or analyst reports. An event study begins by specifying a model of what price movements are "expected" based on

⁶⁸ "New Anti-TNF Golimumab Significantly Reduced Signs and Symptoms of Ankylosing Spondylitis According to Phase 3 Study Findings; Patients with Painful and Progressive Form of Inflammatory Spinal Arthritis Receiving Monthly Golimumab Treatment Showed Marked Improvements in Physical Function," *PR Newswire*, November 7, 2007, 17:30.

outside market factors and then testing whether the deviation from expected price movements are sufficiently large that simple random movement can be rejected as the cause.

73. A well accepted method for performing an event study is to estimate a regression model over some period of time to observe the typical relationship between the market price of the relevant security and broad market factors. I have performed such an analysis where I evaluate the relationship between the Common Stock's daily returns (percentage change in price) controlling for a broad market index (the "S&P 500") and an industry index (the "S&P Pharmaceutical Index").⁶⁹

74. I implement the event study using a rolling regression model because, as I will demonstrate later, there is strong evidence that the relationship between the Common Stock returns and the market indices changed over time and that volatility did not remain constant over the Class Period. For each trading day I construct a regression using data from the past 120 trading days.⁷⁰ This ensures that the relationship between the Common Stock and the market factors updates over time according to the data observed over the most recent 120 trading day (roughly six month) period. Use of a rolling model to account for changing volatility and changing relationships among market indices is observed in the peer-reviewed literature.⁷¹

⁶⁹ I have removed Schering and Merck from the Standard and Poor's 500 Pharmaceuticals Index which is a capitalization-weighted index with SPX as its parent index.

⁷⁰ See, A. Craig MacKinlay, "Event Studies in Economics and Finance," *Journal of Economic Literature*, Vol. 35, No. 1 (March 1997), pp. 13-39. The article states, "For example, in an event study using daily data and the market model, the market model parameters could be estimated over the 120 days prior to the event." Also note that I have removed outliers with Schering-specific news (observations with extremely high abnormal returns) and disclosure dates from the regression models. The dates removed are December 4, 2006, April 19, 2007, October 22, 2007, December 12, 2007, January 14, 2008, January 15, 2008, and January 17, 2008.

⁷¹ Phillip A. Braun, Daniel B. Nelson, and Alain M. Sunier, "Good News, Bad News Volatility, and Betas," *Journal of Finance* 50, 1995, p. 1597.

75. The model indicates that there is a positive correlation between the Common Stock and the control variables. For example, looking at the regression for the 120 days prior to August 22, 2007, the estimated coefficient for the S&P 500 is 1.10 which means that a 1% rise in the S&P 500 predicts slightly more than a 1% increase (1.10%) in Schering's return. The estimated coefficient for the S&P Pharmaceutical Index is 0.92, meaning that the expected return for Schering is about a 0.92% increase for every 1% increase in the S&P Pharmaceutical Index over and above the return of the S&P 500. **Exhibit 6** plots the estimated coefficients for the Common Stock rolling regression models for each day during the Class Period.

76. Another important statistic from the regression is the Standard Deviation of the Errors, which measures the degree of imprecision in the predictions from the model. Using our example regression on the Common Stock for August 22, 2007, the model predicts that absent any new firm-specific information, the price of the Common Stock would rise by 1.40%. Because of the inherent randomness observed in stock price returns, we do not expect the model to predict returns exactly. In this example we observe an actual return of 1.80%. Thus, the "abnormal return" is 0.40% (the actual return of 1.80% minus the predicted return of 1.40%). We then rely on the standard deviation of the errors from the regression model to tell us if this abnormal return of 0.40% is sufficiently large that we reject random movement as the explanation.

77. A "t-statistic" measures the number of standard deviations between the actual observation and the prediction. For the example date, an abnormal return of 0.40% represents 0.325 standard deviations, or a t-statistic of 0.325 (0.40% abnormal return divided by the standard deviation of the errors of 1.22%). Probability theory tells us that based on randomness alone, the abnormal return should only have a t-statistic of greater than 1.96 standard deviations

5% of the time.⁷² Restating this point another way, we have 95% confidence that the actual return will fall within 1.96 standard deviations of the predicted return unless there is some non-random explanation. Since our example only has a t-statistic of 0.325, we would say that the abnormal return is not statistically significant and we could not reject randomness as the cause. However, if on a particular day we observe an abnormal return that has a t-statistic of greater than 1.96 (“statistically significant”) and we observe new firm-specific information, we reject randomness as the explanation and infer that the new information is the cause of the stock price movement.

78. **Exhibit 7** shows that the standard deviation of the errors increased substantially during the Class Period. The stock market overall experienced a substantial increase in volatility during the Class Period, and Schering was no exception. By adopting the rolling regression models, my event study adjusts for the changing relationship between Schering Common Stock returns and the market indices.

79. **Exhibit 8** presents the abnormal returns and the threshold for statistical significance for each day during the Class Period. Statistically significant abnormal returns occur when the abnormal return crosses the significance threshold.

80. To analyze cause and effect, I also identified days with new potentially material news. My analysis of the firm-specific information for Schering securities included news articles from Factiva, analyst reports issued by equity research firms covering Schering and Merck, credit reports issued by the credit rating agencies, and SEC filings issued by Schering and Merck.

⁷² David I. Tabak and Frederick C. Dunbar, “Materiality and Magnitude: Event Studies in the Courtroom,” Ch. 19, *Litigation Services Handbook, The Role of the Financial Expert*, Third Edition, 2001.

81. I first downloaded from Factiva all headlines listed under top sources for Schering during the Class Period.⁷³ To determine which dates to include, I relied on a large body of event study literature that has evaluated what types of new information affect stock prices. For example, there are many articles and financial treatises that explain theoretically and demonstrate empirically that earnings announcements and changes in dividend policy often (but not necessarily always) cause a material change in investors' beliefs regarding the value of a security.⁷⁴ Therefore, identification of earnings reports, changes in dividend rates, and financial forecasts by the Company provide an objective set of news to identify. I identified 7 days in this category out of 124 total news dates (5.7%).

82. In addition, the academic literature shows that investors react significantly to drug development announcements in the pharmaceutical industry, even more so than to financial news, possibly due to the large R&D component of the industry.⁷⁵ Drug research is highly regulated and standardized. Positive news at various stages along the process are associated with statistically meaningful stock price increases, including news of the initiation of Phase I⁷⁶ and

⁷³ Factiva lists its top source as including Dow Jones Newswires, Major News and Business Publications, Press Release Wires, and Reuters Newswires.

⁷⁴ For example, see William H. Beaver "The Information Content of Annual Earnings Announcements," *Empirical Research in Accounting: Selected Studies*, 1968, supplement to the *Journal of Accounting Research*, Vol. 6, (1968), pp. 67-92; Robert G. May, "The Influence of Quarterly Earnings Announcements on Investor Decisions as Reflected in Common Stock Price Changes," *Journal of Accounting Research*, Vol. 9, *Empirical Research in Accounting: Selected Studies* 1971 (1971), pp. 119-163; Joseph Aharony and Itzhak Swary, "Quarterly Dividend and Earnings Announcements and Stockholders' Returns: An Empirical Analysis," *The Journal of Finance*, Vol. 35(1), March 1980, pp. 1-12.

⁷⁵ Elisabeth Dedman, Stephen W.-J Lin, Arun J. Prakash and Chun-Hao Change, "Voluntary disclosure and its impact on share prices: Evidence from the UK biotechnology sector," *Journal of Accounting and Public Policy*, Vol. 27 (2008), pp. 195-216.

⁷⁶ According to clinicaltrials.gov, a service of the U.S. National Institutes of Health, Phase I trials are "Initial studies to determine the metabolism and pharmacologic actions of drugs in humans, the side effects associated with increasing doses, and to gain early evidence of effectiveness; may include healthy participants and/or patients." See <http://clinicaltrials.gov/ct2/info/glossary#phase1>.

Phase II trials,⁷⁷ FDA approvals, and updates between these steps.⁷⁸ Drug companies tend to release more good news than bad, but the market reacts to both.⁷⁹ Furthermore, other research has demonstrated that companies see positive abnormal returns when the FDA decides to “fast-track” approval of a drug.⁸⁰ Therefore, in addition to earnings announcements, I include new information about drug research from Phase I initiation through FDA approval as news events. I identified 61 dates (49.2%) classified under this category.

83. It is also well-accepted and uncontroversial that news about government regulation, legislation, and/or law enforcement scrutiny can often (but need not always) change investors’ beliefs regarding firm value.⁸¹ This makes economic sense since these actions can

⁷⁷ According to clinicaltrials.gov, a service of the U.S. National Institutes of Health, Phase II trials are “Controlled clinical studies conducted to evaluate the effectiveness of the drug for a particular indication or indications in patients with the disease or condition under study and to determine the common short-term side effects and risks.” Phase III trials are “Expanded controlled and uncontrolled trials after preliminary evidence suggesting effectiveness of the drug has been obtained, and are intended to gather additional information to evaluate the overall benefit-risk relationship of the drug and provide an adequate basis for physician labeling.” Phase IV trials are post-marketing trials. See <http://clinicaltrials.gov/ct2/info/glossary#phases>.

⁷⁸ Salil K. Sarkar and Pieter J. de Jong, “Market response to FDA announcements,” *The Quarterly Review of Economics and Finance*, 46, 2006, pp. 586-597; Elisabeth Dedman, Stephen W.-J Lin, Arun J. Prakash and Chun-Hao Change, “Voluntary disclosure and its impact on share prices: Evidence from the UK biotechnology sector,” *Journal of Accounting and Public Policy*, Vol. 27 (2008), pp. 195–216; Philip Joos, “Discussion – ‘The Usefulness of Biotechnology Firms’ Drug Development Status in the Evaluation of Research and Development Costs,” *Journal of Accounting, Auditing and Finance*, Winter 2003, Vol. 18, No. 1, pp. 197-205.

⁷⁹ Elisabeth Dedman, Stephen W.-J Lin, Arun J. Prakash and Chun-Hao Change, “Voluntary disclosure and its impact on share prices: Evidence from the UK biotechnology sector,” *Journal of Accounting and Public Policy*, Vol. 27 (2008), pp. 195–216; Salil K. Sarkar and Pieter J. de Jong, “Market response to FDA announcements,” *The Quarterly Review of Economics and Finance*, 46, 2006, pp. 586-597.

⁸⁰ Christopher W. Anderson and Ying “Jenny” Zhang, “Security Market Reaction to FDA Fast Track Designations,” Forthcoming, *Journal of Health Care Finance* Vol. 37(2), 2010, pp. 26-47.

⁸¹ For example, see Jean-Claude Bosch and Insup Lee, “Wealth Effects of Food and Drug Administration (FDA) Decisions,” *Managerial and Decision Economics*, Vol. 15(6), Nov.–Dec., 1994, pp. 589-599; Another study found that stock prices declined as a result of regulation proceedings: Thomas D. Dowdell, Suresh Govindaraj, and Prem C. Jain, “The Tylenol Incident, Ensuing Regulation, and Stock Prices,” *Journal of Financial and Quantitative Analysis*, Vol. 27(2), June 1992; John McDowell, 2005, “A Look at the Market’s Reaction to the Announcements of SEC Investigations.”; Baruch Lev, “The Impact of Accounting Regulation on the Stock Market: The Case of Oil and Gas Companies,” *The Accounting*

impose costs or change the future growth and profitability of the firm. I identified 23 dates (18.6%) that were related to legal or regulatory risk or action.

84. A fourth group of news dates is based upon announced mergers and acquisitions. As with the other categories, academic research has shown that these types of events often (but not always) provide new material news to investors.⁸² Included in this category, and more common than M&As, are joint ventures between firms, such as the venture between Schering and Merck that produced Vytorin and Zetia. Like M&As, academic research indicates that the announcement of joint ventures generally affect market value, and may be especially beneficial in the pharmaceutical industry which is heavily dependent on research and development.⁸³ I classified 23 dates (18.6%) under this category as well.

85. The final category of news that I considered was issuance of analyst and credit rating reports that adjusted prior price targets, recommendations, or ratings. Academic literature shows that stock prices often (but not always) react significantly to both earnings forecast

Review, Vol. 54(3), July 1979, pp. 485-503; Nihat Aktas, Eric de Bodt, and Richard Roll, "Market Response to European Regulation of Business Combinations," *Journal of Financial and Quantitative Analysis*, Vol. 39(4), December 2004, pp. 731-757.

⁸² For example, see literature review in Spyros I. Spyrou and Georgia Siougle, "Stock price reaction to M&A Announcements: Evidence from the London Stock Exchange," *Journal of Money, Investment and Banking*, 16, 2010.

⁸³ For example, see Jeongsuk Koh and N. Venkatraman, "Joint Venture Formations and Stock Market Reactions: An Assessment in the Information Technology Sector," *The Academy of Management Journal*, 1991, Vol. 34, No. 4, pp. 869-892; J. W. Allen and G. M. Phillips, "Corporate equity ownership, strategic alliances, and product market relationships," *The Journal of Finance*, 2000, Vol. 55, pp. 2791-2815.

revisions and especially revisions in analysts' target prices.⁸⁴ I classified 31 dates (25.0%) under this category.⁸⁵

86. Taken together, the five categories described above represent 118 of the 124 dates I identified as containing Schering-specific news, and looking within this subset alone, we can reject the hypothesis that there is no relationship between these new news events and significant stock price movements.⁸⁶ There were six other days (4.8%) where the news does not fall into one of the above mentioned categories. These news items include changes in corporate governance, Company announcements about potential future products, and reports on doctors' opinions of Schering drugs and their prescription behavior.⁸⁷

87. Out of the 423 trading days Schering Common Stock traded during the Class Period, I identified 124 days that had potentially material Company-specific news.⁸⁸ On 26 of these days (or 21.0%), I found a statistically significant stock price movement, either positive or

⁸⁴ Alon Brav and Reuven Lehavy, "An Empirical Analysis of Analysts' Target Prices: Short-Term Informativeness and Long-Term Dynamics," *The Journal of Finance*, Vol 58, No. 5 (October 2003), pp. 1933-1967; Joseph D. Piotroski and Darren T. Roulstone, "The Influence of Analysts, Institutional Investors, and the Insiders on the Incorporation of Market, Industry, and Firm-Specific Information into Stock Prices," *The Accounting Review*, Vol. 49(4) (October 2004), pp. 1119-1151.

⁸⁵ More than one category of news could occur on a day, such as an earnings announcement and an analyst report. Therefore, percents will sum to greater than 100.

⁸⁶ A Chi-square test indicates that I can reject the null hypothesis that news had no impact on Schering's stock price movements. A Chi-square test is a test of statistical significance, similar to a t-test, but is designed specifically to test the significance of differences in relative frequencies. For example, see Alan Agresti, *Categorical Data Analysis*, Wiley, 1990, pp. 42-54: "The [Chi-square] statistic...compares an observed distribution with a hypothetical one."

⁸⁷ Note that the results of the statistical test I perform are robust to many different sets of events considered to be Schering-specific news. For instance, in this industry there are an abundance of joint ventures, involving many companies and regarding a wide spectrum of medicines. Certainly not all of these joint ventures would be expected to impact Schering's security prices, but some may be important enough to do so. If I were to remove joint ventures from my list of Schering-specific news, the results of the event study and my conclusions regarding the cause and effect relationship between new news and changes in the Common Stock price are unaltered.

⁸⁸ A copy of my event study will be provided to Defendants with the materials I relied upon in forming my opinions (as set forth in Appendix A).

negative. Because I use a 95% confidence interval to assess statistical significance, we would only expect to find 5% of the trading days to have significant price movements by chance alone.⁸⁹ Therefore, there is a much greater incidence of significant price movements (21.0%) on news days than the baseline expectation (5.0%) if there was no cause and effect relationship. Conversely, on the 299 days *without* potentially material news, only 18 (or 6.0%) were statistically significant. The incidence of significant results on non-news days (6.0%) is not far from the baseline expectation (5%) of what would be expected from randomness alone.

88. A Chi-square test suggests the probability of observing such a distribution of significant days between news and non-news days if there were no statistical relationship between new news and significant price movements is less than one in ten thousand. Therefore, these results provide scientific evidence of a cause and effect relationship between Schering-specific news and Schering Common Stock price movements.

89. The methodology I employ here to test for a cause and effect relationship is endorsed in the academic literature by authors typically associated with defendants in securities litigation cases. For example, they state, “In the case of testing whether there is a cause and

⁸⁹ “Returns are often assumed to be distributed normally...”(See Ernst R. Berndt, *The Practice of Econometrics: Classic and Contemporary*, Addison-Wesley, 1991, p. 22). About 95% of the area under the normal curve is within two (1.96) standard deviations in each direction of the mean, leaving a total of 5% in the tails. Using a 95% confidence interval is consistent with the statistical tests used in the event study where I consider an abnormal return more than 1.96 standard deviations from the expected return to be statistically significant. To view a standard normal distribution and read about its properties *see* Robert D. Mason, Douglas A. Lind and William G. Marchal, “The Normal Probability Distribution,” Ch. 7 in *Statistical Techniques in Business and Economics*, Irwin/McGraw-Hill, Tenth Edition, 1999. Also, from David I. Tabak and Frederick C. Dunbar, “Materiality and Magnitude: Event Studies in the Courtroom,” Ch. 19, *Litigation Services Handbook, The Role of the Financial Expert*, Third Edition, 2001, p. 9: “...if an event is material at the 5 percent level, this means that there is only a 5 percent likelihood that the abnormal return (or the stock price movement once one controls for market, industry, and other effects) could have been caused by the stock’s normal random price fluctuations. Alternatively, we can say that we are 95 percent confident that the abnormal return is greater than what would be expected based on the stock’s normal random price fluctuations. It is not clear what level of statistical significance corresponds to a legal definition of materiality. As Mitchell and Netter point out, the 95 percent confidence level is commonly used...”

effect relationship between news and movements in a stock price, this means not simply finding a case where there was news and a stock price movement, but finding two samples of defendant's stock prices-one with news and one without-and testing whether the price movements for the two samples are distinguishable."⁹⁰

90. Based on the event study I have performed, I find that there is a clear cause and effect relationship between new material public information about Schering and the market price of its Common Stock.

G. ADDITIONAL FACTOR 1: MARKET CAPITALIZATION

91. Thomas and Cotter find that firms with a larger market capitalization tend to have "larger institutional ownership and tend to be listed on the New York Stock Exchange with a greater analyst following."⁹¹ Therefore, market capitalization is another quantifiable measure that is likely correlated with efficiency.

92. The Common Stock had higher market capitalization than the vast majority of NYSE stocks, thus suggesting this factor is supportive of efficiency. During the Class Period, prior to the additional offering of its Common Shares in August 2007, Schering had between 1.481 billion and 1.496 billion shares outstanding. After the secondary offering, there were 1.62 billion shares outstanding. Insiders at all times held less than 1% of the outstanding shares.

⁹⁰ Paul A. Ferrillo, Frederick C. Dunbar, PhD, and David Tabak, PhD, "The 'Less Than' Efficient Capital Markets Hypothesis: Requiring More Proof From Plaintiffs In Fraud-On-The-Market Cases," *St. John's Law Review*, Vol. 28(1), 2004. Tabak is a Senior VP with NERA, and Dunbar, formerly of NERA, is currently Economic Fellow in the Office of Economic Analysis at the SEC. Ferrillo is the Counsel in the Business and Securities Litigation Department of Weil Gotshal & Manges, LLP. See also David Tabak, "Use and Misuses of Event Studies to Examine Market Efficiency," *NERA Economic Consulting*, September 11, 2009.

⁹¹ Randall S. Thomas and James F. Cotter, "Measuring Securities Market Efficiency in the Regulatory Setting," *Law and Contemporary Problems*, Vol. 63, p. 117.

Schering's public float (shares outstanding less insider holdings) ranged from 1.475 billion to 1.487 billion shares prior to the secondary offering and the conversion of the mandatory convertible preferred stock into shares of common stock and 1.537 billion to 1.612 billion after.⁹²

93. Based on the market price, the market capitalization for the Common Stock averaged over \$39 billion during the Class Period. **Exhibit 9** shows that the Common Stock's market capitalization was at approximately the 96th percentile of the combined NYSE and NASDAQ markets during the Class Period.⁹³ In other words, at year-end 2006 and 2007, the Common Stock had a higher market capitalization than at least 96% of the firms on the combined NYSE and NASDAQ.

94. Given that the Common Stock's market capitalization is consistently large relative to other publicly traded companies, this factor is supportive of market efficiency for the Common Stock.

H. ADDITIONAL FACTOR 2: THE BID-ASK SPREAD

95. Bid-ask spread is an important indicator of the degree to which a market is developed. The bid-ask spread represents a measure of the cost to transact in a market. Narrow bid-ask spreads indicate less uncertainty regarding valuation and that reasonably sized trades will not substantially impact the market price. Wider bid-ask spreads indicate greater liquidity costs and less ability to trade without moving the market price. In addition, the wider the bid-ask spread, the more costly it is to arbitrage away small inefficiencies. Thus, the narrower the bid-ask spread, the greater indication of an efficient market.

⁹² The term "float" can also mean shares outstanding minus insider holdings *plus short interest*. For ease of exposition, I am not including the short interest in what I call the "float."

⁹³ The market capitalization of all the companies that were traded in the NYSE and the NASDAQ as of December 30, 2006, and December 31, 2007 was acquired from Bloomberg.

96. I analyzed bid-ask spreads for Schering Common Stock throughout the entire Class Period. During this period, the time-weighted bid-ask spread for Schering Common Stock for each calendar month ranged between .020% and .077%. I also compared the bid-ask spread of Schering Common Stock against the bid-ask spread of other publicly traded stocks in March 2008, the last full month in the Class Period, and October 2006, the month in which Schering had its widest bid-ask spread.⁹⁴ During March 2008, the time-weighted average bid-ask spread for the Common Stock was 0.049%, while the median time weighted average bid-ask spread for a randomly selected group of 100 other NYSE and NASDAQ stocks during this same time was 0.241%.⁹⁵ This ranked Schering as the 12th smallest bid-ask spread among a randomly selected group of 100 other NYSE and NASDAQ stocks during this same time. In October 2006, when Schering's bid-ask spread was the widest, Schering once again had the 12th smallest bid-ask spread. This indicates that approximately 88% of common stocks trading on the NYSE and NASDAQ had higher bid-ask spreads (and therefore more expensive to trade) than Schering Common Stock. Accordingly, this analysis suggests the Common Stock's bid-ask spread compares favorably with other exchange traded stocks and further supports a conclusion of market efficiency.

⁹⁴ Quote data for Schering and other publicly traded stocks was obtained from the TICK database. See www.tickdata.com.

⁹⁵ The average bid-ask spread was calculated by taking a time-weighted average of the spread during trading hours on the primary exchange of each security. Spread is calculated as the difference between the bid price and ask price divided by the midpoint of the bid-ask spread. I calculated the National Best Bid and Offer using the data filtering procedures described in Roger D. Huang and Hans R. Stall, "Dealer versus auction markets: A paired comparison of execution costs on NASDAQ and the NYSE," *Journal of Financial Economics* Vol. 41, 1996, pp. 313-357.

I. ADDITIONAL FACTOR 3: INSTITUTIONAL OWNERSHIP

97. Institutional investors are considered to be sophisticated and well-informed with access to most publicly available information for the stocks that they own. These investors include mutual funds, pension funds, investment banks and other types of large financial institutions that have substantial resources to analyze the securities they purchase for their portfolios. Most institutions that hold over \$100 million in assets are required to report their equity holdings on a quarterly basis on SEC Form 13F.⁹⁶ As **Exhibit 10** shows, these large institutions reported owning an overwhelming majority of all Schering Common Stock during the Class Period. From the quarter end of June 30, 2006 to March 31, 2008, institutional holdings of Schering Common Stock ranged from 79% to 93% of the shares outstanding according to Capital IQ.⁹⁷ This high level of institutional ownership of Schering Common Stock during the Class Period indicates that the market price was reflective of active trading by extremely sophisticated and knowledgeable investors and supports a conclusion of market efficiency.

J. ADDITIONAL FACTOR 4: AUTOCORRELATION

98. If previous price movements of a security have the ability to predict future price movements, then it is said to be “autocorrelated.” Autocorrelation is relevant to efficiency because if the autocorrelation is persistent and sufficiently large that a trader could profit from taking advantage of the autocorrelation, it suggests market inefficiency because past price movements are not fully reflected in the current price.

99. Autocorrelation may occur from time to time for random reasons or due to the pattern of firm-specific news. Efficiency would only be violated, however, if the autocorrelation

⁹⁶ See <http://www.sec.gov/about/forms/form13f.pdf>

⁹⁷ These figures are slightly higher (79% to 94%) if shares outstanding are adjusted for insider holdings.

were large enough and persistent enough that a trader could consistently earn riskless profits over time.⁹⁸

100. A well-accepted methodology to test for the existence of autocorrelation is to run a regression analysis that tests whether, on average, the abnormal return from the previous day has a statistically significant effect on the abnormal return today.⁹⁹ If the previous day's abnormal return has no statistically significant predictive power, then there is no evidence of autocorrelation. Even if the regression shows a significant result for a certain period, then one must ask whether the effect is persistently significant and large enough to suggest a predictable arbitrage opportunity in the next period.

101. Schering Common Stock did not exhibit any autocorrelation during the Class Period. **Exhibit 11** shows the coefficient and the associated t-statistic for the regression of Schering Common Stock abnormal return against the abnormal return from the previous day for each quarter during the Class Period. Schering Common Stock had a t-statistic of less than 1.96 for all quarters during the Class Period, implying that the abnormal returns on one day could not be used to accurately predict returns on a subsequent day during any quarter of the Class Period.¹⁰⁰ Stated differently, the regression results are inconsistent with the notion that an investor could consistently predict abnormal movements and earn arbitrage profits. Therefore, this factor also supports the conclusion that the Common Stock traded in an efficient market throughout the Class Period.

⁹⁸ Doron Avramov, Tarun Chordia, and Amit Goyal, "Liquidity and Autocorrelations in Individual Stock Returns," *The Journal of Finance*, Vol. LXI, No. 5, 2006, pp. 2367-2368; Michael C. Jensen, "Some Anomalous Evidence Regarding Market Efficiency," *Journal of Financial Economics* Vol. 6, Nos. 2/3, 1978, pp. 95-101.

⁹⁹ William H. Greene, *Econometric Analysis*, Prentice Hall, Sixth Edition, 2008, Chapter 19, p. 644.

¹⁰⁰ The Durbin-Watson statistic also indicates that Schering Common Stock exhibited no auto-correlation during the Class Period.

102. Every factor analyzed supports my opinion that Schering Common Stock traded in an efficient market. In addition, as I discuss in Section IX, there was considerable trading in Schering Options during the Class Period. Academic articles have demonstrated that options written on existing assets can improve efficiency by permitting an expansion of the contingencies that are covered by the market.¹⁰¹ Empirical analysis also showed that option listings are associated with a decrease in bid-ask spread and increase in quoted depth, trading volume, trading frequency, and transaction size – an overall improvement of the market quality of the underlying stocks.¹⁰²

VIII. APPLICATION OF EFFICIENCY FACTORS TO SCHERING PREFERRED STOCK

103. Preferred securities are a hybrid between equity and debt, and the terms for preferred securities can vary substantially for each issue.¹⁰³ They often receive a coupon payment like a bond, but may have a very long or perpetual maturity. They typically rank junior to debt (e.g. debt-holders would be repaid in a liquidation before preferred shareholders), but senior to common equity. Preferred securities also often receive preferential treatment when it comes to dividends (e.g. preferred share coupon payments often must be made before any dividends can be paid to common shareholders).¹⁰⁴ In many cases, preferred stock can be converted to common

¹⁰¹ Stephen A. Ross, “Options and Efficiency,” *The Quarterly Journal of Economics*, Vol. 90, (Feb., 1997), pp. 75-89.

¹⁰² Raman Kumar, Atulya Sarin and Kuldeep Shastri, “The Impact of Options Trading on the Market Quality of the Underlying Security: An Empirical Analysis,” *The Journal of Finance*, Vol. LIII, No. 2, (April 1998), pp. 717-732.

¹⁰³ For example, see the discussion in William F. Sharpe, Gordon J. Alexander and Jeffery V. Bailey, *Investments*, Prentice Hall, Fifth Edition, 1995, p. 420.

¹⁰⁴ William F. Sharpe, Gordon J. Alexander and Jeffery V. Bailey, *Investments*, Prentice Hall, Fifth Edition, 1995, p. 420.

stock. Sometimes this option is held by the investor and other times by the issuer. In addition, preferred stock represents ownership in the company, but owners of preferred stock do not usually have voting rights.¹⁰⁵

104. Certain investors might find preferred stock more attractive relative to common stock for a variety of reasons. For example, it may offer regular cash flows that are not as sensitive to company performance as dividends on common stock, and institutions may find preferred stock particularly attractive because of favorable rules governing dividends. Also, it is typically a safer investment vehicle because in the event of a company's liquidation, preferred stockholders enjoy priority distribution of the company's assets over the common shareholders.¹⁰⁶

105. On August 15, 2007, Schering offered 10 million shares of 6.00% mandatory convertible preferred stock at \$250 a share, referred to as the 2007 Preferred Stock. The issue amounted to \$2.5 billion and was listed in Bloomberg under the CUSIP of "EPO29088." Each share was to be automatically converted to between 7.4 and 9.09 common shares on August 13, 2010 depending on the average closing price per share of the common shares over the 20 trading day period ending on the third trading day prior to the conversion date. However, at any time prior to this date, holders also had the option to convert their Preferred Shares into 7.4 Common Shares.¹⁰⁷ **Exhibit 12** displays the Preferred Stock closing price and trade volume for each day throughout the Class Period. **Exhibit 13** provides further details on the Preferred Stock.

¹⁰⁵ Richard A. Brealey and Stewart C. Myers, *Principles of Corporate Finance*, McGraw-Hill, 1988, Third Edition, pp. 308-309.

¹⁰⁶ Frank K. Reilly and Keith C. Brown, *Investment Analysis and Portfolio Management*, The Dryden Press, Sixth Edition, 2000, p. 82; Richard A. Brealey and Stewart C. Myers, *Principles of Corporate Finance*, McGraw-Hill, 1988, Third Edition, pp. 308-309.

¹⁰⁷ Schering Inc. 6% Mandatory Convertible Preferred Stock Prospectus Supplement filed August 2, 2007, p. 2.

106. **Exhibit 14** provides a summary of my findings for each efficiency factor. Based on my evaluation of the efficiency factors for the Preferred Stock, it is my opinion that it also traded in an efficient market. First, Schering's Preferred Stock had an average weekly trading volume that was more than sufficient to suggest an efficient market. Second, there was an abundance of securities analysts following and reporting on Schering, including credit rating agency reports which specifically mentioned the Preferred Stock. Third, Schering was S-3 eligible. Fourth, Schering Preferred Stock's market capitalization was not uncommonly low relative to all stocks traded on the NYSE and NASDAQ during the Class Period (not just compared to other preferred stocks). Fifth, Schering Preferred Stock had a reasonable bid-ask spread. Sixth, Schering Preferred Stock actively traded on the NYSE, fulfilling the *Cammer* factor regarding market makers. Seventh, there was no evidence of autocorrelation during the Class Period. Eighth, institutions purchased more than 90 percent of the initial offering of Schering Preferred Stock, indicating that this security was held by sophisticated, well-informed investors. Moreover, there was a clear cause and effect relationship between new information and price changes and no autocorrelation of abnormal returns. These factors all support that the Preferred Stock, like the Common Stock, traded in an open, developed, and efficient market throughout the Class Period.

A. CAMMER FACTOR 1: AVERAGE WEEKLY TRADING VOLUME

107. Recall that the first *Cammer* factor is the average weekly trading volume of a security. **Exhibit 15** plots Preferred Stock's weekly trading volume as a fraction of shares outstanding and public float for each week during the Class Period. The average weekly turnover as a percentage of shares outstanding was 4.63% (median of 4.25%). The fact that the Preferred

Stock had an average weekly turnover that exceeded 4% of the shares outstanding indicates strong evidence of an efficient market for the Preferred Stock.

108. The average annualized turnover velocity for the Preferred Stock is also comparable to the average stock traded on the NYSE during this time period. The Preferred Stock had an average annualized turnover velocity of 250% and 211% in 2007 and 2008 which is greater than the average NYSE stock in 2007 and near the NYSE average in 2008, just 30 percentage points lower, and still quite high. **Exhibit 16** compares the Annualized Turnover velocity for the Common Stock and the Preferred Stock with the average NYSE stock.

109. In short, the trading volume for the Preferred Stock is either greater than or comparable to the average for all stocks on the NYSE. The relatively high trading volume in the Preferred Stock throughout the Class Period supports the conclusion that the market for the Preferred Stock was efficient.

B. CAMMER FACTOR 2: ANALYST COVERAGE

110. Recall that **Exhibit 5** listed an abundance of analyst reports covering the Common Stock during the Class Period. All analyst reports on Common Stock provide valuable information in assessing an investment in the Preferred Stock as well. For instance, a downgrade of Common Stock due to higher than expected losses might signal to the preferred shareholders the potential for a dividend cut. In addition to the hundreds of reports on the Common Stock, there were numerous reports, specifically issued during the Class Period concerning Schering Preferred Stock and bonds, issued by the major credit rating agencies, Moody's and Fitch.¹⁰⁸

¹⁰⁸ I currently possess only Fitch reports. Moody's also issued ratings reports specifically on Schering Preferred Stock. However, since I have not obtained Moody's reports, I have not included them in my analysis. Doing so would simply strengthen my conclusion.

Because preferred stocks generally are senior to common stock, but junior to bonds, reports on bonds from the credit agencies also provide valuable information in assessing an investment in the Preferred Stock.

111. In summary, the breadth of analysts covering Schering, the quantity of analyst reports, and the number of credit agency reports issued both before and during the Class Period indicate that there was an active market for information about Schering generally and the Preferred Stock specifically. This level of analyst coverage further suggests that the Preferred Stock traded in an efficient market.

C. CAMMER FACTOR 3: MARKET MAKERS

112. *Cammer* alludes to this factor as relevant for an over the counter market with no volume reporting. Similar to the Common Stock, the Preferred Stock did not trade over-the-counter, but rather traded on the NYSE and had continuous volume reporting. As discussed previously, in my opinion, the market structure of the NYSE is supportive of the conclusion that the Preferred Stock traded in an efficient market.

D. CAMMER FACTOR 4: SEC FORM S-3 ELIGIBILITY

113. As detailed above, Schering complied with all the requirements for a company to be S-3 eligible and consistently filed Form S-3s for additional securities offerings, including a Form S-3ASR filed on August 2, 2007 for the issuance of 2007 6% Mandatory Convertible Preferred Stock. Schering meets the standard of Form S-3 eligibility which supports the conclusion that the Preferred Securities traded in an efficient market.

E. CAMMER FACTOR 5: PRICE REACTION TO NEW INFORMATION

114. I also found a strong cause and effect relationship between new firm-specific news and movements in the Preferred Securities. I employed the same event study methodology described in Section VII, to the Preferred Stock.¹⁰⁹ As displayed for the Common Stock, **Exhibit 17** presents the abnormal returns and the threshold for statistical significance for each day during the Class Period that the Preferred Stock traded.

115. For example, in reaction to the news on January 14, 2008 that ENHANCE did not meet the primary endpoint, the Preferred Stock price fell by 5.64%. The abnormal return was also 5.64% and the t-statistic was -4.94. This indicates that the Preferred Stock price incorporated the negative firm-specific news into its stock price quickly.

116. The market also quickly incorporated unexpected positive news about Schering into the Preferred Stock price. Similar to the Common Stock, on November 8, 2007, Schering's Preferred Stock price showed a positive abnormal return based on news that an experimental anti-tumor drug had been shown to significantly aid in patient improvement.¹¹⁰ The preferred market index and industry index were flat that day, and the regression model predicted flat returns for Schering Preferred Stock. Thus the entire price increase of 2.5% was attributable to the positive Schering-specific news. The t-statistic for this day is over 2, indicating a statistically significant event.

¹⁰⁹ Like the Schering Common Stock, the regression for Schering Preferred Stock returns controls for the S&P 500 Total Return and the S&P Pharmaceutical Index Returns (Net of Market) that excludes Schering and Merck. The regression period begins on August 15, 2007 (issue date) and extends to March 28, 2008 (end of the Class Period).

¹¹⁰ "New Anti-TNF Golimumab Significantly Reduced Signs and Symptoms of Ankylosing Spondylitis According to Phase 3 Study Findings; Patients with Painful and Progressive Form of Inflammatory Spinal Arthritis Receiving Monthly Golimumab Treatment Showed Marked Improvements in Physical Function," *PR Newswire*, November 7, 2007, 17:30.

117. There are other examples of the Preferred Stock reacting to negative and positive news. For example, after market close on January 16, 2008, it was reported that Congress was investigating advertising for Vytorin following the release of the top-line results from ENHANCE which suggested that Vytorin may have no advantage over generic cholesterol medicine. On the next day, the Preferred Stock fell by 6.36% with an abnormal return of -4.62%. The abnormal return was statistically significant as the t-statistic was -4.04.

118. Moreover, after the full and detailed ENHANCE results were revealed through a conference on March 30, 2008, the Preferred Stock declined by 20.54%.¹¹¹ The abnormal return for the Preferred Stock was 22.16% with a t-statistic of -19.41.

119. I identified 47 news days in the Class Period from the time the Preferred Shares were issued.¹¹² The five categories of news described earlier represent 44 of the 47 dates I identified as containing Schering-specific news, and looking within this subset alone, we can reject the hypothesis that there is no relationship between these new news events and significant stock price movements.¹¹³ As with the Common Stock, the other three days include news regarding new product plans and physician reaction to preliminary ENHANCE results. On over half of the news days there was new information regarding a Schering drug, such as a drug study

¹¹¹ “Vytorin Study Shows Little Change in Artery Thickness,” *Dow Jones News Service*, March 30, 2008 13:00; “Vytorin study still leaves questions unanswered,” *Reuters News*, March 30, 2008, 13:04.

¹¹² A copy of my event study will be provided to Defendants with the materials I relied upon in forming my opinions (as set forth in Appendix A).

¹¹³ A Chi-square test indicates that I can reject the null hypothesis that news had no impact on Schering’s stock price movements. A Chi-square test is a test of statistical significance, similar to a t-test, but is designed specifically to test the significance of differences in relative frequencies. For example, see Alan Agresti, *Categorical Data Analysis*, Wiley, 1990, pp. 42-54: “The [Chi-square] statistic...compares an observed distribution with a hypothetical one.”

result, recommendation, or approval.¹¹⁴ Legal or regulatory news occurred on approximately 30 percent of the news days and one quarter of the news days were due to analyst reports.¹¹⁵

120. Of the 155 trading days Schering Preferred Stock traded during the Class Period, I identified 47 days that had potentially material Company-specific news. On 12 of these days, (or 25.53%), I found a statistically significant price movement, either positive or negative. This is much higher than the 5% we would expect if there was no relationship between Company-specific news and movements in the market price. Conversely, on the 108 days without potentially material news, only 3 (or 2.78%) were statistically significant, which is entirely consistent with what would be expected from randomness alone. A Chi-square test suggests the probability of observing such a distribution of significant days if there were no statistical relationship between new news and significant price movements is less than one in ten thousand. Therefore, these results provide scientific evidence of a cause and effect relationship between Schering-specific news and Schering's Preferred Stock price movements.¹¹⁶

121. Taken together, the event study demonstrates a strong cause and effect relationship between newly available public information and changes in the price of the Preferred Stock. In my opinion, the swift and substantial reaction to incorporate unexpected news into the stock price, as reflected in the event study, is supportive of an efficiency finding.

¹¹⁴ More than one category of news could occur on a day, such as an earnings announcement and an analyst report. Therefore, percents will sum to greater than 100.

¹¹⁵ As I found with the Common Stock, the results of the statistical test I perform are robust to many different sets of events considered to be Schering-specific news. If I remove any news category from my list of Schering-specific news, the results of the event study and my conclusions regarding the cause and effect relationship between news and changes in the Preferred Stock returns are unaltered.

¹¹⁶ Similar to the Common Stock, the Chi-square test for the Preferred Stock indicates that I can reject the null hypothesis that news had no impact on Schering's preferred stock price movements. Because the distribution of news days and significant days contains at least one cell with an expected value less than 5, I use a similar statistical test of significance specially designed to handle such a situation, called Fisher's Exact Test, which confirmed that these differences are highly statistically significant. (See Alan Agresti, *Categorical Data Analysis*, Wiley, 1990, pp. 59-62.)

F. ADDITIONAL FACTOR 1: MARKET CAPITALIZATION

122. In many respects, it makes sense to consider the market capitalization of Schering as a whole for the Preferred Stock because the overall size of Schering affects things such as the amount of news and analyst coverage. In that case, the opinion I reached in the Section VII.F. is applicable to the Preferred Stock.

123. However, even if I only consider the market capitalization of the Preferred Stock individually, it provides support that the stock traded in an efficient market. **Exhibit 18** shows the calculation of the market capitalization at the end of 2007 for the Preferred Stock. It also summarizes how the market capitalization for the Preferred Stock compares against the size of other *common stocks* on the NYSE and NASDAQ.¹¹⁷

124. The market capitalization of the Schering Preferred Stock was, at a minimum, in the 76th percentile of all *stocks* on the NYSE and NASDAQ. Thus, it had a greater market capitalization than at least 76% of other publicly traded stocks on those two exchanges.

125. I am also unaware of any insider holdings of Preferred Securities, therefore the float is equal to the amount issued shown on **Exhibit 13**.

126. Given that the Preferred Stock's market capitalization is comparable to the market capitalization of common stocks traded on the NYSE, this factor is supportive of market efficiency for the Preferred Stock.

¹¹⁷ I calculated market capitalization by multiplying the closing price by shares outstanding at year-end 2007.

G. ADDITIONAL FACTOR 2: THE BID-ASK SPREAD

127. As with the Common Stock, I analyzed bid-ask spreads for the Preferred Stock and compared them to a random sample of other publicly traded stocks in March 2008.¹¹⁸ The Preferred Stocks had a bid-ask spread at the median of the distribution for common stocks on the NYSE and NASDAQ. Because the bid-ask spread of the Preferred Stock is not uncommonly low relative to other securities traded on the major exchanges, this factor supports efficiency.

H. ADDITIONAL FACTOR 3: INSTITUTIONAL OWNERSHIP

128. The list of purchasers of the August 2007 Schering Preferred offering, as provided by Defendants, indicates that the great majority of shares, over 90%, were purchased by Institutions.¹¹⁹ Institutional investors are considered to be sophisticated and capable of employing substantial resources to analyze the securities they purchase for their portfolios. This high level of institutional ownership of Schering Preferred Stock during the Class Period indicates that the market price was reflective of active trading by extremely sophisticated and knowledgeable investors and supports a conclusion of market efficiency.

I. ADDITIONAL FACTOR 4: AUTOCORRELATION

129. As with the Common Stock, I performed a regression analysis for the Preferred Stock during the Class Period that tests whether, on average, the abnormal return from the

¹¹⁸ Quote data for Schering and other publicly traded stocks was obtained from the Tick Data. See www.tickdata.com.

¹¹⁹ This is true even if I make the conservative assumption of removing the approximately 1.3 million overallotment shares from the institutional purchasers listed in the document “Purchasers in the August 2007 Schering-Plough Mandatory Convertible Preferred Offering” (GS_0021687 – GS_0021695).

previous day has a statistically significant effect on the abnormal return today.¹²⁰ If the previous day's abnormal return has no statistically significant predictive power, then there is no evidence of autocorrelation. Even if the regression shows a significant result for a certain period, then one must ask whether the effect is persistently significant and large enough to suggest a predictable arbitrage opportunity in the next period. If no such arbitrage opportunity exists, then there is insufficient evidence to conclude the market is inefficient.

130. As with the Common Stock, the Preferred Stock did not exhibit consistent autocorrelation during the Class Period. **Exhibit 19** shows the coefficient and the associated t-statistic for the regression of Schering Preferred Stock abnormal return against the abnormal return from the previous day for each quarter during the Class Period. As the exhibit shows, there was not a consistent relationship that would allow one to predict Schering Preferred Stock returns based on its prior movement.¹²¹ Therefore, this factor also supports the conclusion that the Preferred Stock traded in an efficient market throughout the Class Period.

131. In sum, every factor analyzed supports my opinion that Schering Preferred Stock traded in an efficient market.

IX. MARKET EFFICIENCY FOR CALL AND PUT OPTIONS ON SCHERING COMMON STOCK

132. Options are derivative securities, a type of security that has a price and value whose ultimate value is dependent on the market price of an underlying security or asset. In this case, the pricing for the Schering Options at issue are dependent on the market price of Schering Common Stock.

¹²⁰ William H. Greene, *Econometric Analysis*, Prentice Hall, Sixth Edition, 2008, Chapter 19, p. 644.

¹²¹ The Durbin-Watson statistic also indicates that Schering Preferred Stock exhibited no autocorrelation during the Class Period.

133. There are two basic types of options: call options and put options. A call option gives the holder of the option the right to buy an asset (in this case, Schering Common Stock) by a certain date called the expiration date, and for a certain price called the strike price or exercise price. A put option gives the holder the right to sell an asset by an expiration date at the strike price. Options can be either American or European, with the distinction being that American options can be exercised at any time up the expiration date, whereas European options can be exercised only on the expiration date itself.¹²² The price of an option, also referred to as the “premium,” depends on a number of factors including how the current stock price compares to the exercise price, the amount of time to expiration, anticipated dividends, expected volatility of the underlying stock, and interest rates.

134. All of the Schering Options were American options that were traded on multiple options exchanges including NYSE Options,¹²³ the Chicago Board Options Exchange (“CBOE”) and Boston Options Exchange (“BOX”). During the Class Period, a total of 204 call option “series” and 204 put option series were outstanding. The expiration dates for these options ranged from August 19, 2006 to January 16, 2010, and the strike prices ranged from \$2.5 to \$45.¹²⁴ For example, one call option series had an expiration date of January 17, 2009 and an exercise price of \$30 per share. This call option gave the holder the right to buy Schering Stock at \$30 per share any time prior to January 17, 2009.

135. I demonstrated in Section VII how Schering Common Stock satisfied each of the efficiency factors. If one concludes that Schering Common Stock was priced efficiently and

¹²² John Hull, *Options, Futures and Other Derivatives*, 5th Edition, Prentice Hall, 2003, p. 6.

¹²³ <http://www.nyse.com/futuresoptions/nyseamex/nyseamexoptionsequityoptions.shtml>

¹²⁴ Data on options for Schering Common Stock were provided by Ivolatility. See www.ivolatility.com. For each option series, the Ivolatility data contain on a daily basis, bid price, ask price, mean transaction price, volume, open interest, implied volatility, and standard option sensitivities (known as delta, gamma, vega/kappa, theta).

therefore reflected the value of the alleged misstatements and omissions, it is then logical and natural to assume that because option pricing is dependent on the stock price, the inflation caused by the misrepresentations and omissions that affects the stock price by definition would translate into the value of derivative instruments such as call and put options as well (so long as the options market is efficient).

136. A standard method for evaluating efficiency of the options market is to test what is known as “put-call parity.”¹²⁵ Put-call parity refers to a specific relationship that must exist between the price of the underlying security and prices of put and call options with the same expiration date and strike price. If the prices of a put-call pair are not consistent with each other and the underlying security, there would be a violation of put-call parity and a potential arbitrage opportunity. An arbitrage opportunity exists when a trader has the ability to earn a risk-free profit based on inconsistent pricing of securities. Prices that exhibit a consistent pattern of arbitrage opportunities would be inconsistent with market efficiency.

137. For American options on dividend paying stocks, the put-call parity relation implies an upper and lower bound on the value of the put and call option prices such that:

$$S_0 - D - K \leq C - P \leq S_0 - Ke^{-rT}$$

¹²⁵ Robert C. Klemkosky and Bruce G. Resnick, “Put-Call Parity and Market Efficiency,” *The Journal of Finance*, Vol. 34, No. 5 (December 1979), pp. 1141-1155; Avraham Kamara and Thomas W. Miller, Jr., “Daily and Intradaily Tests of European Put-Call Parity,” *The Journal of Financial and Quantitative Analysis*, Vol. 30, No. 4 (December 1995), pp. 519-539; Leng Y. Goh and David Allen, “A Note on Put-call Parity and the Market Efficiency of the London Traded Options Market,” *Managerial and Decision Economics*, Vol. 5, No. 2 (June 1984), pp. 85-90.

where S_0 denotes the current price of the underlying common stock, D denotes the present value of future dividends, K denotes the exercise price of the options, C is the call option price, P is the put option price, r is the risk-free interest rate and T is the time to expiration of the options.¹²⁶

138. I tested both the upper and lower bounds over the pairs of Schering Options with valid bid and ask prices. **Exhibit 20** shows only 11 violations of put-call parity, representing one tenth of one percent of the over 11,000 option-date pairs during the Class Period. I also note that these 11 violations were transitory and did not exist on adjacent days for any specific option. This provides evidence that the market price of Schering Options consistently reacted contemporaneously with changes in the market price of Schering Stock so as to prevent arbitrage opportunities. This is strong evidence that the market for Schering Options was efficient and that any mispricing due to the alleged misstatements and omissions would translate into the prices of Schering Options.

139. Also, note that because the put-call parity relationship incorporates the price of Schering Common Stock, the evidence of efficiency for Schering Options also bolsters the evidence that Schering Common Stock traded in an efficient market during the Class Period. There was no evidence of consistent arbitrage opportunities between Schering Options and Schering Common Stock. Furthermore, empirical research has shown that the existence of options for a given security are associated with factors related to efficient markets for the underlying stocks, such as a decrease in the bid-ask spread and an increase in quoted depth, trading volume, trading frequency, and transaction size.¹²⁷

¹²⁶ For details, see John Hull, *Options, Futures and Other Derivatives*, 5th Edition, Prentice Hall, 2003, pp. 174 -180.

¹²⁷ Stephen A. Ross, "Options and Efficiency", *The Quarterly Journal of Economics*, Vol. 90, February 1976, pp. 75 -89; Raman Kumar, Atulya Sarin, and Kuldeep Sharstri, "The Impact of Options Trading on the Market Quality of the Underlying Security: An Empirical Analysis", *The Journal of Finance*, Vol. LIII, No. 2, April 1998, pp. 717-732.

140. Finally, I constructed a pricing index for Schering Options that measures the weighted average change in value of Schering Call Options and Schering Put Options on each day. Specifically, I constructed a series r_t separately for Schering Call Options and Schering Put Options which on each day (t) that is equal to:

$$\sum_{i=1}^N \frac{o_{i(t-1)}(p_{it} - p_{i(t-1)})}{o_{i(t-1)}(p_{i(t-1)})}$$

Where r_t represents the return on the index, o_{it} is the open interest on option series i at time t and p_{it} is the price of option series i at time t . I then used this price index to test for a cause and effect relationship between Schering Option Prices and new firm-specific news using the same methodology employed for Schering Common Stock and Schering Preferred Stock.¹²⁸ I found a statistically significant relationship between new Schering-specific news and movements in the market prices of Schering Put and Call Options. Therefore, beyond testing put-call parity, I have shown that a pricing index of Schering Options also exhibits a cause and effect relationship to new firm-specific news, thus supporting that Schering Options traded in an efficient market.

X. LOSS CAUSATION

141. Plaintiffs' counsel has advised me that at the class certification stage of litigation, Plaintiffs' burden does not extend to proving loss causation. However, based on the analysis performed in the context of my efficiency analysis, I observe that Plaintiffs' allegations satisfy the elements of loss causation (e.g., the materiality of Defendants' misstatements and the statistical significance of alleged corrective disclosures).

¹²⁸ To summarize, I regressed the option index return against the market and industry index and then tested whether the abnormal returns were statistically significant using a rolling 120-day regression.

142. Economists assessing loss causation typically evaluate whether there is economic evidence to link later price declines (if any) to the revelation of the relevant truth regarding prior misstatements or omissions. The results of the event studies performed in Sections VII and VIII demonstrate a causal link between the alleged corrective disclosures and economic losses suffered by investors of Schering Common Stock, Preferred Stock, and Options.

143. Plaintiffs' primary allegation is that Schering withheld, in violation of the law, adverse information that it knew (or recklessly disregarded) about Zetia, Vytorin, and ENHANCE. By 2006, Defendants allegedly knew or recklessly disregarded that the ENHANCE trial would not yield positive results, but the full relevant truth regarding the results of ENHANCE was not disclosed to the public until March 2008. In addition to this omission, Plaintiffs allege that Schering made materially false and misleading statements regarding what they knew (or recklessly disregarded) about Zetia, Vytorin, and ENHANCE. For purposes of evaluating loss causation, I presume these allegations are true.

144. There is a clear economic link between information about the results of drug trials, sales of the drug being evaluated by the trials, and the market value of the drug producer. Prescription drug sales, by virtue of requiring a doctor's prescription, are driven largely by doctor's perception of the efficacy of a drug. To determine the efficacy of a particular drug, doctors rely on data from drug trials for the respective drug. For example, Y.K. Loke, whose research includes market reactions to adverse drug-related news states, "[i]n evidence-based medicine, trial data are of paramount importance when choosing appropriate treatments for patients. Doctors rely on clinical trials to direct, or change, their practice; thus, the ability to appraise a trial report critically is a useful skill..."¹²⁹ More specifically, as noted in an news

¹²⁹ Y.K. Loke, "How to Appraise Clinical Trials," *Medicine*, 2003, Volume 31, Issue 8, p. 32.

article in anticipation of the ENHANCE results, “[r]elease of the full study could have an impact on prescribing patterns for Vytorin and Zetia according to Roger Blumenthal, director of the Johns Hopkins Ciccarone Center for the Prevention of Heart Disease in Baltimore.”¹³⁰

Unfavorable results from ENHANCE could therefore reasonably be expected to negatively affect doctors’ perception of the efficacy of Vytorin and hence future sales of the drug. For this reason, the results of ENHANCE were important for the future sales of Vytorin.

145. A generally accepted economic principle is that the value of a company is directly related to expectations of future earnings.¹³¹ As described earlier, revenue and earnings for Schering were largely generated by sales of Vytorin and Zetia. According to a *Reuters News* article, “[t]he [ENHANCE] trial has garnered intense investor interest because Vytorin and Zetia have annual sales of about \$5 billion, and are important to future earnings growth of the companies.”¹³² Therefore, because of the economic link between the results of ENHANCE and anticipated future sales, and the link between anticipated future sales and market value, there is a clear economic link between information regarding the outcome of ENHANCE and the market value of Schering securities. Assuming Plaintiffs’ allegations are proven to be true, in view of the statistically significant declines in the market value of Schering securities upon release of the ENHANCE results and related news, it is my opinion that there is a direct and foreseeable causal link between the allegations and investor losses.

¹³⁰ “Vytorin Study’s Full Data Awaited at Cardiology Conference,” *Dow Jones News Service*, March 28, 2008 11:57.

¹³¹ See, for example, David I. Tabak and Frederick C. Dunbar, “Materiality and Magnitude: Event Studies in the Courtroom,” Ch. 19, *Litigation Services Handbook, The Role of the Financial Expert*, Third Edition, 2001, where they describe as a well-accepted principle that, “the price of an efficiently traded stock is equal to the present value of the discounted future stream of free cash flows.” Also, Aswath Damodaran, *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, John Wiley & Sons, Inc., 1996, pp. 9-10: “This [DCF] approach has its foundation in the ‘present value’ rule, where the value of any asset is the present value of the future cashflows on it.”

¹³² “UPDATE 2-Schering, Merck cholesterol drug misses goal,” *Reuters News*, January 14, 2008, 09:43.

146. As described in the discussion of market efficiency and the *Cammer* factors, I constructed event studies to determine whether the market price of Schering Securities displayed a cause and effect relationship with the release of new information that would be expected to change the value of the securities. I apply the same event study methodology to examine whether disclosures of the alleged misstatements and omissions caused economic losses for investors.

147. **Exhibits 21 through 23** respectively summarize the results of the event studies and loss causation analyses for Schering Common Stock, Preferred Stock, and Options for two examples of Plaintiffs' alleged corrective disclosure events by showing the daily abnormal price changes and statistical significance on those two example days. The exhibits also illustrate that the total net abnormal price movement after controlling for market effects on the January 14, 2008 and March 31, 2008 disclosure events was -\$7.69 per share for the Common Stock, -\$56.79 for the Preferred Stock.¹³³ In my view, these net abnormal price movements represent economic losses causally related to the disclosure of ENHANCE results and therefore, assuming Plaintiffs' allegations are true, causally related to Defendants' wrongful actions.¹³⁴ I describe these two events in more detail below.

148. January 14, 2008 — Before the market opened on January 14, the top-line results of ENHANCE were publicly disclosed, revealing that ENHANCE failed to meet the primary

¹³³ **Exhibit 23** shows that the average abnormal decline in value for a purchaser of a Schering Call Option was 37.50% and 81.44% for January 14 and March 31, respectively. The average abnormal change in value for a seller of a Schering Put Option on those days was 47.32% and 120.11%, respectively.

¹³⁴ While the discussion in this section focuses primarily on tying specific disclosures to the abnormal price movement on a single day, it is important to note that the use of multi-day event windows is ubiquitous in the event study literature (and in the litigation context) in markets that are presumed to be efficient. That is because economists recognize that while news in an efficient market is incorporated rapidly into securities prices, the price discovery process is not instantaneous, especially in the face of unexpected news that creates substantial uncertainty and is difficult to value.

endpoint.¹³⁵ According to a *Reuters News* article also released that morning, “[t]he trial has garnered intense investor interest because Vytorin and Zetia have annual sales of about \$5 billion, and are important to future earnings growth of the companies.”¹³⁶

149. Upon learning the news, Merrill Lynch cut its rating on Schering that day from Buy to Neutral.¹³⁷ It stated that it had “downgraded Schering to neutral from buy...because it anticipates further pressure on Vytorin and Zetia prescription trends,” and noted that “[w]e do not see Schering stock as a buy when the momentum of the key financial driver is uncertain.”¹³⁸

150. Despite the disappointing results, some analysts remained positive because the top-line results were limited to the primary endpoint, rather than the full set of study results.¹³⁹ For example, Banc of America Securities reaffirmed a “Neutral” rating for the Company.¹⁴⁰ However, Merrill Lynch pointed out that “[t]he mostly positive analyst reactions don’t seem to have relieved investors’ worries.”¹⁴¹ Other analysts believed that the reaction to ENHANCE could even be positive because the results with respect to the primary endpoint, while not supporting increased efficacy, did not suggest adverse outcomes.¹⁴²

¹³⁵ “Merck/ Schering-Plough Pharmaceuticals Provides Results of the ENHANCE Trial,” *Business Wire*, January 14, 2008, 08:05.

¹³⁶ “UPDATE 2-Schering, Merck cholesterol drug misses goal,” *Reuters News*, January 14, 2008, 09:43.

¹³⁷ “ENHANCE disappointment warrants Neutral,” *Merrill Lynch Analyst Report*, January 14, 2008.

¹³⁸ “ENHANCE disappointment warrants Neutral,” *Merrill Lynch Analyst Report*, January 14, 2008.

¹³⁹ “2nd UPDATE: Vytorin Fails To Benefit Artery Vs. Statin Drug” *Dow Jones News Service*, January 14, 2008, 13:58.; “Quick Take: ENHANCE: Similar IMT Change, Better LDL Reduction, Clean Safety,” *Cowen & Company*, January 14, 2008; “Study: Cholesterol combination not superior to solo drug,” *Associated Press Newswires*, January 14, 2008, 15:49; “Analysts divided on significance of Merck/Schering drug trial results,” *AFX Asia*, January 15, 2008; “Schering-Plough’s misery provides opportunity,” *EP Vantage*, January 16, 2008.

¹⁴⁰ Schering-Plough shares fall on failed cholesterol study, but analysts maintain ratings,” *Associated Press Newswires*, January 14, 2008, 18:43.

¹⁴¹ “ENHANCE disappointment warrants Neutral,” *Merrill Lynch Analyst Report*, January 14, 2008.

¹⁴² “SGP, MRK I The Most “Shocking” Thing About ENHANCE Was Its Impact on Share Price,” *BernsteinResearch*, January 15, 2008.

151. Although “analysts [were] mixed on how equal results in the two study sections would affect Vytorin sales,”¹⁴³ investors reacted adversely. In fact, on January 14, both the Common Stock and Preferred Stock experienced abnormal returns of -8.42% (-\$2.28 per share) and -5.64% (-\$14.06 per share), respectively. Similarly, the price index for Schering Call Options fell by 36.38% (abnormal decline of 37.50%) and the price index for Schering Put Options rose by 44.02% (an abnormal increase of 47.32% which indicates a decline in value for sellers of Puts) after controlling for market and industry effects. These abnormal returns were highly statistically significant, indicating that I can reject random price fluctuations as the cause, and infer that the changes in market value were caused by the newly released information that day. I searched for other new Schering-specific information other than the news regarding ENHANCE that could potentially account for the significant decline in value on January 14, 2008 and found none. In addition, there were no previous news events disclosing the ENHANCE top-line results. Therefore, assuming Plaintiffs’ allegations are true, I conclude there was dissipation of \$2.28 per share of artificial inflation in the price of the Common Stock and \$14.06 per share of artificial inflation in the price of the Preferred Stock on this day, and that such declines were direct and foreseeable consequences of the alleged misrepresentations and omissions.

152. The disclosure of the top-line results on January 14, 2008 did not disclose all of the pertinent ENHANCE trial data, and Schering, doctors, and the market remained optimistic for the eventual disclosure of the full results in March 2008. For example, during the Lehman Brothers Healthcare Conference on March 18, 2008, Schering CEO Hassan said:

¹⁴³ “Merck, Schering-Plough’s cholesterol drug combination fails to benefit patients in study,” *Associated Press Newswires*, January 14, 2008, 09:00.

[W]e are now ready to face the new challenges, including the media storm that has been generated around the **mischaracterizations of the top-line results from the Merck Schering-Plough ENHANCE trial**. Since the top-line results were announced, prescriptions for VYTORIN and ZETIA have declined. There have been some early signs of stabilization, but it's too early to discern any trends from this data. **We believe it is very important that the scien[tific] process be respected and full results discussed by the scientific community, and we look forward to this opportunity at the upcoming ACC meeting.**¹⁴⁴

153. Moreover, as *Dow Jones* reported on Friday, March 28, 2008:

While the top-line study results are already out, doctors are looking for additional information from the study, which will be reviewed by an expert panel of cardiologists [at the American College of Cardiology conference].

...

Prescription volume for both Vytorin and Zetia has declined since January. **But the full data could paint a more complicated picture, and one that is potentially favorable for the drugs.**

...

Also, the study is expected to provide a breakdown of the various measurements of carotid artery thickness, including a site on the artery called the "common carotid." The top-line data were an average of thickness at three different sites on the artery. And doctors expect to learn more about the data quality problems that appeared to arise during the course of the trial, which both Merck and Schering-Plough have said partly accounted for the long delay in releasing trial results.¹⁴⁵

154. March 31, 2008 – On Sunday March 30, the full and detailed results of the ENHANCE study were disclosed at the Chicago ACC Conference.¹⁴⁶ The details of the results presented were revealed broadly to the market the next day through a press release. The full results were also published online in the *New England Journal of Medicine*. Although many

¹⁴⁴ "SGP – Schering-Plough at Lehman Brothers Healthcare Conference Final Transcript," *Thomson StreetEvents*, March 18, 2008, 10:15, pp. 2-3 (emphasis added).

¹⁴⁵ "Vytorin Study's Full Data Awaited At Cardiology Conference," *Dow Jones News Service*, March 28, 2008, 11:57, (emphasis added).

¹⁴⁶ "Vytorin Study Shows Little Change In Artery Thickness," *Dow Jones News Service*, March 30, 2008, 13:00.

analysts and doctors had held out hope for some positive results,¹⁴⁷ the March 30 news provided none. Dr. Kastelein, principal investigator of ENHANCE and lead author of the *New England Journal of Medicine* article, said: “In January, basically, there were two things. The primary endpoint, which was negative, and the safety, which was good...What we’ve now added is every imaginable secondary endpoint and exploratory analysis. However you turn the data, there is nothing.”¹⁴⁸

155. Speaking on behalf of an expert panel appointed by the ACC to review the ENHANCE results, Dr. Harlan Krumholz of Yale University said that “[y]ou’ve just seen a negative trial that should change practice...It seems to be a very strong study.”¹⁴⁹ Dr. Krumholz continued that the panel’s “strongest recommendation is that people need to go back to statins.”¹⁵⁰ These sentiments were echoed by Dr. Allen Taylor of the Walter Reed Army Medical Center who stated, “[e]very single explanation or attempt to discredit the trial based on the standpoint of the sponsors is completely debunked by the data. . . . If it is not the investigator, it is not the data, it is not the endpoint, it must be the drug.”¹⁵¹ And panelist Dr. Joseph Messer, a cardiologist from Chicago, stated that “the [expert] panel’s recommendations reflect a consensus,” suggesting that it was not just a handful of doctors and cardiologists who were wary of Vytorin and Zetia.¹⁵²

¹⁴⁷ “Vytorin no help for heart,” *Newsday*, March 31, 2008: “A lot of us thought that there would be some glimmer of benefit,” said Dr. Roger Blumenthal, a Johns Hopkins University cardiologist and spokesman for the American Heart Association.

¹⁴⁸ “Vytorin study still leaves questions unanswered,” *Reuters News* March 30, 2008, 13:04.

¹⁴⁹ “Panel: Doctors Should Cut Vytorin, Zetia Use,” *Dow Jones News Service*, March 30, 2008, 16:57.

¹⁵⁰ “Vytorin expert panel says ‘go back to statins’,” *Reuters News*, March 30, 2008, 18:57.

¹⁵¹ “Schering-Plough, Merck’s Vytorin Failed to Stop Artery Damage,” *Bloomberg*, March 30, 2008, 13:00.

¹⁵² “Vytorin expert panel says ‘go back to statins’,” *Reuters News*, March 30, 2008, 18:57.

156. Many news articles and analysts covered the panel's remarks and reported on expected implications that same day. For example, one article quoted Dr. Kruhmholz as saying that "patients should turn back to using [cheaper] statins and other proven drugs."¹⁵³ S&P downgraded Schering's long-term ratings to negative.¹⁵⁴ Also, Michael Krensavage, an analyst with Raymond James in New York, remarked, "[i]t is going to be tough to promote the drug without any evidence that it provides a benefit. . . . People were hoping to see a glimmer of evidence that Zetia can save lives and it is very hard to find that glimmer of hope among these data."¹⁵⁵

157. Similarly, *CBS News* compared the information disclosed on March 30, 2008 with the information that was disclosed when the top-line results were revealed on January 14, 2008:

Well, what's new this morning is a complete analysis of all that data by an independent panel. And you know, there was a glimmer of hope back in January that when they really looked at the data, they'd find something positive here. And in fact, that hope is now gone.¹⁵⁶

158. Various news articles also acknowledged that investors and doctors were "stunned" by the material, adverse information revealed on March 30:

Wall Street — and the drug companies — had expected that the data presentation would generate more positive reviews to counter the steady flow of negative publicity that has dogged Vytorin and Zetia since preliminary study results were released in January. Prescriptions plunged before leveling off over the past month, sending Schering-Plough's stock price down 46% since the beginning of the year and Merck's down 35%. Instead, the opposite happened.¹⁵⁷

¹⁵³ "Vytorin expert panel says 'go back to statins'," *Reuters News*, March 30, 2008, 18:57.

¹⁵⁴ "S&P puts Schering-Plough's long-term ratings on creditwatch negative," *AFX Asia*, March 31, 2008, 14:27.

¹⁵⁵ "Schering, Merck's Vytorin Should Be Last Resort, Doctors Say," *Bloomberg*, March 31, 2008, 12:01.

¹⁵⁶ "Profile: Health Watch; Dr. Emily Senay Discusses New Study about Ineffectiveness of Vytorin," *CBS News: The Early Show*, March 31, 2008.

¹⁵⁷ "Schering, Merck Defend Their Drugs as Stocks Suffer," *The Wall Street Journal*, April 1, 2008.

Full results of a failed trial on Vytorin... **left doctors stunned** that the drug did not improve heart disease even though it worked as intended to lower three key risk factors... **“A lot of us thought that there would be some glimmer of benefit,”** said Dr. Roger Blumenthal, a Johns Hopkins University cardiologist and spokesman for the American Heart Association. Many doctors were prescribing Vytorin without trying older, proven medications first, as guidelines advise. The key message from the study is “don’t do that,” Blumenthal said. ...doctors prescribing Vytorin in the mistaken belief it always works “should be thinking twice,” said Duke University cardiologist Dr. Robert Califf. He is co-leader of an even more pivotal study of the drug [IMPROVE-IT].¹⁵⁸

...“The **surprising thing** about the results is despite an LDL cholesterol that was 50 points lower in the Vytorin group, there was no evidence for any reduction in the buildup of plaques in the carotid or femoral arteries, said Steven Nissen, head of cardiology at the Cleveland Clinic in Ohio. “There is no positive news here.”¹⁵⁹

...The surprisingly negative results are likely to fuel an already fevered debate over why it took so long for the drugs’ two manufacturers to release the findings.

...
“The sad fact is the scientific process was undermined here because these companies choose not to release information in a timely fashion,” [cardiologist Dr. Sanjay Kaul] said.¹⁶⁰

The study and comments dashed hopes among some doctors, patients and investors that the panel could offer a silver lining to troubled drugs.

...
Dr. Kastelein said a midcourse change in the way the images were read caused part of the delay but improved the quality of the readings. Still, he said further efforts mounted by Merck and Schering-Plough to refine the data were of no value, and indicated he would have been ready to present the findings as long as a year ago if the company had released the data to him.¹⁶¹

¹⁵⁸ “Doctors Wary after Cholesterol Drug Flop,” *Bloomberg*, March 30, 2008, 09:28 (emphasis added).

¹⁵⁹ “Schering-Plough, Merck’s Vytorin Failed to Stop Artery Damage,” *Bloomberg*, March 30, 2008, 13:00 (emphasis added).

¹⁶⁰ “Healthcare: 2 Drugs Might Have No Benefit; Data on Vytorin and Zetia, Long in Coming, May Change the Way Many heart Disease Patients Are Treated,” *Los Angeles Times*, March 31, 2008.

¹⁶¹ “Panel Deals Blow to Two Cholesterol Drugs — Cardiologists Call to Curtail the Use of Vytorin, Zetia,” *The Wall Street Journal*, March 31, 2008.

159. On March 31, both the Common Stock and the Preferred Stock experienced abnormal returns of -28.45% (-\$5.42 per share) and -22.16% (-\$42.73 per share), respectively. These abnormal returns were statistically significant, which allows me to reject random chance as the cause of the price declines. Similarly, the index of Schering Call Options fell by a statistically significant 71.22% (abnormal return of 81.44%) and the index of Schering Put Options rose by a statistically significant 109.65% (an abnormal return of 120.11%, thus causing a decline in value for sellers of Puts).

160. I searched for other new Schering-specific news, other than the release of the ENHANCE results, that could account for such a significant decline in market value. The only new Schering-specific news item that could have potentially affected the market price was a story after the market closed on Friday March 28 that stated there would be an increase in the sample size of another clinical trial of Vytorin (Improve-It) that would push the release of the anticipated results back from 2011 to 2012. There is strong evidence that this information is not the primary driver of the decline in value observed on Monday March 31. First, the news coverage and analyst coverage of Schering on Monday March 31 is primarily focused on the ENHANCE results. Second, besides a few brief news articles on the evening of Friday March 28 and Saturday March 29, a search of Factiva returns no major newspapers reporting on the “Improve-it” news and I am unaware of any analyst specifically issuing a report in response to that particular news item. Finally, the earliest news release of which I am aware regarding Improve-It occurred at 5:07 pm on March 28.¹⁶² I reviewed the after-market trading prices for Schering and found that there were 8,200 shares traded after the earliest release of this news which occurred from 5:07 pm to 7:55 pm. Each and every trade that occurred after the release of

¹⁶² “Researchers Increase Size Of Ongoing Vytorin Study,” *Dow Jones News Service*, March 28, 2008, 17:07.

the Improve-It news was at a price equal to or in excess of the official closing price of \$19.47, with an average trading price of \$19.72. The available evidence is therefore inconsistent with the notion that the news regarding Improve-It could explain a substantial portion of the price declines on March 31, 2008.

161. I therefore infer that the disclosure of the ENHANCE results caused the loss in market value. Assuming Plaintiffs' allegations are true, I conclude that there was dissipation of \$5.42 per share of artificial inflation in the price of the Common Stock and \$42.73 per share of artificial inflation in the price of the Preferred Stock on March 31, and that such declines were direct and foreseeable consequences of the alleged misrepresentations and omissions.

162. The event studies and conclusions regarding loss causation demonstrate the materiality of the alleged misstatements and omissions. Event studies are a clear test of materiality because they evaluate whether the newly released information is sufficient to cause a statistically significant change in the market price — therefore signaling that investors found the information important. By way of example, the event studies demonstrated that the allegedly corrective information revealed on January 14, 2008 and March 30, 2008 caused Schering's Common and Preferred Stock to suffer statistically significant abnormal price declines and the value of Schering's Options to decline precipitously for holders of calls and sellers of puts.

163. The materiality of the alleged misrepresentations and omissions is also supported by the "risk factors" contained in Schering's Common Stock offering prospectus for the August 9, 2007 offering dated August 2, 2007:

Schering-Plough's ability to generate profits and operating cash flow is largely dependent upon the continued profitability of Schering-Plough's cholesterol franchise, consisting of Vytorin and Zetia....As a result of [Schering's] dependence on key products, **any events that adversely**

affect the markets for these products could have a significant impact on results of operations.¹⁶³


164. From such information, I conclude there is substantial economic theory and evidence to support my view that the alleged misrepresentations and omissions were material.

165. Finally, based on my review of press reports, analyst reports, SEC filings, and the remainder of the material cited in this report, there is no indication that the results of ENHANCE were generally known to the market or fully reflected in the prices of Schering Securities prior to the disclosure events described above. To conclude otherwise would belie not only the scientifically-demonstrated significant price reactions we observe on the alleged disclosure dates, but is also inconsistent with the intensity of publicity, coverage, and commentary that follows in the wake of the public release of the allegedly corrective information. I am unaware of any analyst covering Schering that substantiated any rumor regarding the results of ENHANCE prior to the corrective disclosures. Nor was there any Company reaction to such speculation. Whatever speculation (positive or negative) there may have been in the market regarding ENHANCE prior to January 14 and March 31, clearly did not substitute for Defendants' disclosure of the official results.

166. I reserve the right to amend this report to reflect new information available to me in light of the ongoing discovery process and/or future rulings from the Court.

¹⁶³ Schering-Plough "Prospectus Supplement to Prospectus Dated August 2, 2007." Nearly identical language can be found in the "risk factors" section in the 10-Ks for 2006 and 2007, (emphasis added).

Respectfully Submitted on February 7, 2011



Chad Coffman